AUTOMOTIVE INDUSTRIES

PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT • SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
ENGINEERING • PRODUCTION • MANAGEMENT

JULY 1, 1950

In This Issue . . .

Significance of GM-UAW Contract

Manufacturing Advances at Ford's Canadian Plant

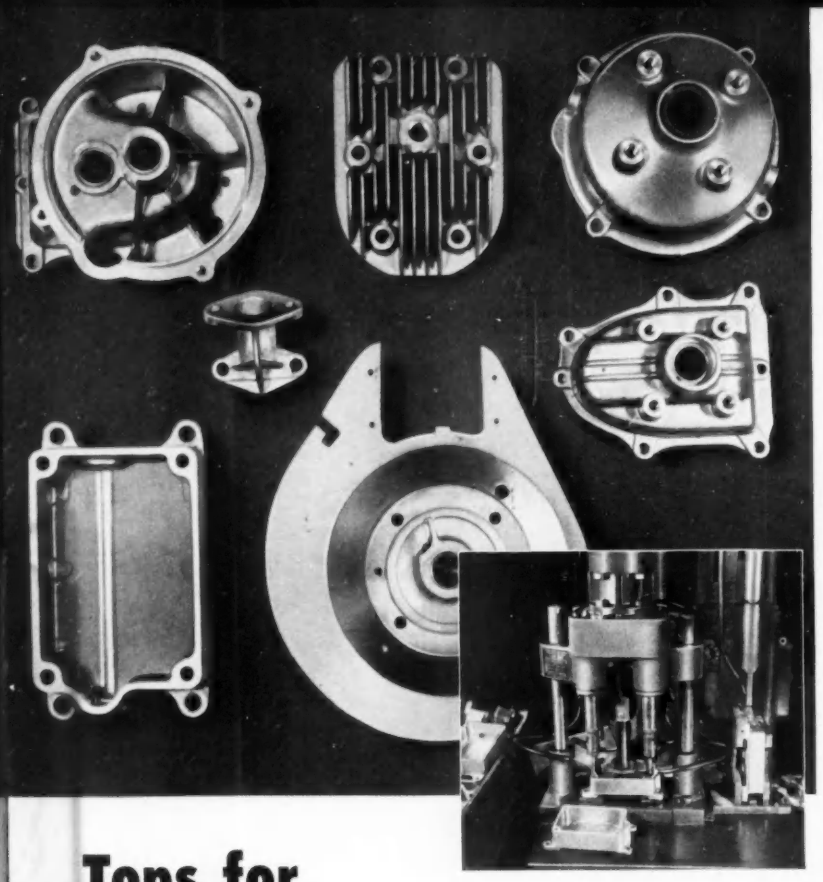
Making Low and Reverse Bands for the Powerglide

Highlights of SAE French Lick Meeting

Design Analysis of Free-Piston Engines

Complete Table of Contents, Page 3

A CHILTON PUBLICATION



Tops for tapping aluminum . . .

FOR DRILLING and tapping operations on aluminum castings, a large midwest manufacturer wanted a cutting oil of light color and low viscosity that would give maximum tool life.

After testing various products, officials found the cutting fluid that fully met their specifications. It was STANICUT 62 FC Cutting Oil recommended for the job by a Standard Oil cutting oil specialist. It was tried in four machines.

A week's run convinced the plant superintendent and the machine operators that STANICUT 62 FC was the cutting oil for the job. *Tool life was double their expectations. Threads cut were smooth and clean. Washability was excellent; oil carry-away was negligible.*

The experience of this company indicates the savings you can make with STANICUT Cutting Oils, not only on aluminum jobs but on a wide variety of operations. You can profit further through the engineering service of a Standard Oil lubrication specialist. He is located within easy reach of your plant. How you can benefit by his on-the-spot service is explained at the right. Standard Oil Company (Ind.), 910 S. Michigan Ave., Chicago 80, Ill.

STANICUT 62 FC
TRADE MARK
Cutting Oil

What's YOUR problem?

W. J. Mackle, lubrication specialist at Standard Oil's Detroit office, helped this company solve a problem by recommending the product that exactly met the requirements of a special job.

He is one of a corps of Standard Oil lubrication specialists located throughout the Midwest to provide "on-the-spot" service to plant operators. One of these lubrication specialists is near your plant. He has plenty of practical experience and has been specially trained for his job in a Standard Oil Lubrication Engineering School. You can obtain his services quickly and easily. Just phone or drop a card, today, to the nearest Standard Oil Company (Indiana) office. When he calls on you, discuss with him the advantages of such outstanding products as:

STANICOOL HD Soluble Oil—Because they contain additional compounding, these heavy-duty soluble oils possess not only the cooling ability of an emulsion but also the ability to give better tool life and finer finishes than can be obtained with a conventional soluble oil.

STANOSTAMP Compounds—Here are three established products for stamping or heavy drawing operations of either low-carbon or alloy steels. Water can be added to these paste compounds to provide the most economical applications. STANOSTAMPS offer maximum protection for dies and work. These compounds can be readily removed in conventional washing equipment.

EUREKA Tempering Oil—From Standard Oil's complete line of quenching and tempering oils, this product is recommended for continuous use in tempering-oil baths at temperatures up to 525°F.

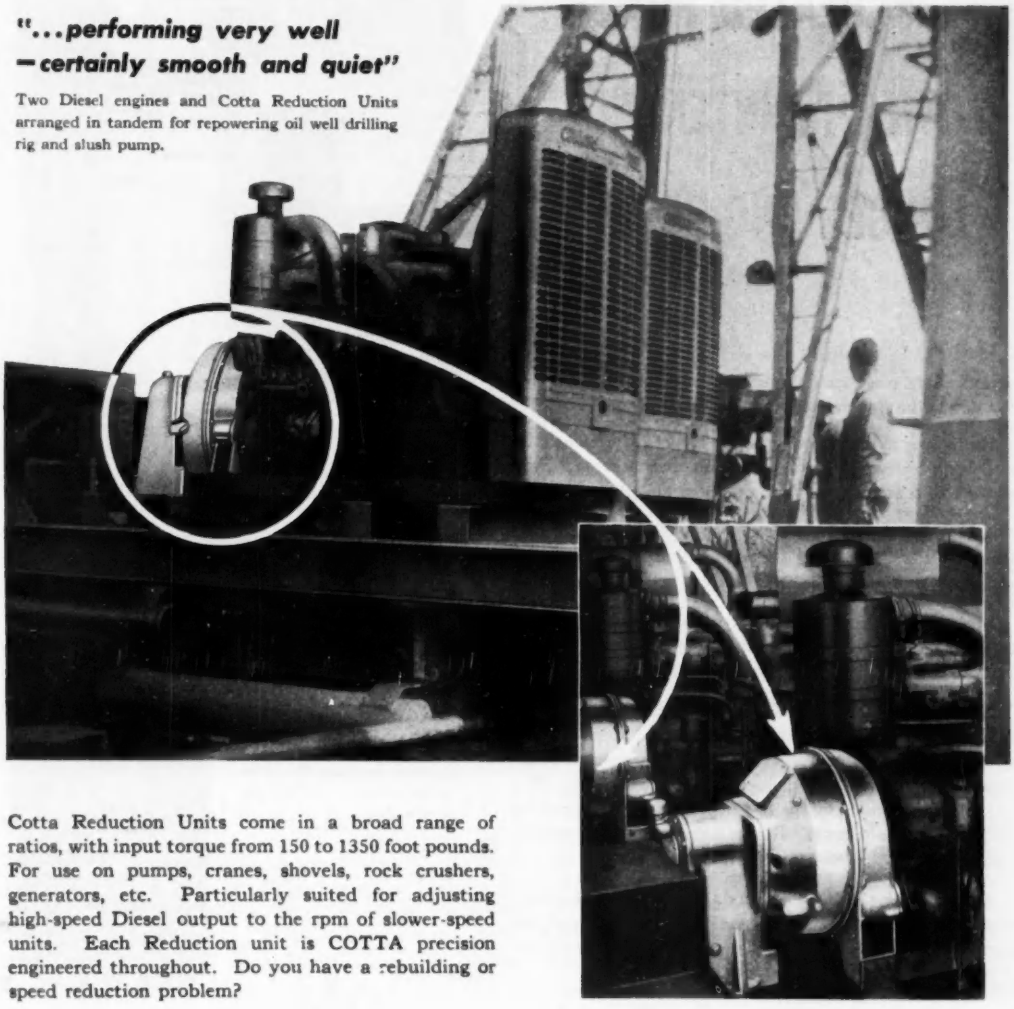
STANDARD OIL COMPANY (INDIANA)

STANDARD

Repower Oil Well Drilling Rig with COTTA Reduction Units

"...performing very well —certainly smooth and quiet"

Two Diesel engines and Cotta Reduction Units arranged in tandem for repowering oil well drilling rig and slush pump.



Cotta Reduction Units come in a broad range of ratios, with input torque from 150 to 1350 foot pounds. For use on pumps, cranes, shovels, rock crushers, generators, etc. Particularly suited for adjusting high-speed Diesel output to the rpm of slower-speed units. Each Reduction unit is COTTA precision engineered throughout. Do you have a rebuilding or speed reduction problem?

THIS INFORMATION WILL HELP YOU

Diagrams, capacity tables, dimensions and complete specifications sent free on request. Just state your problem — COTTA engineers will help you select the right unit for best performance. May we work with you?

COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS

An Assurance of Dependable Service

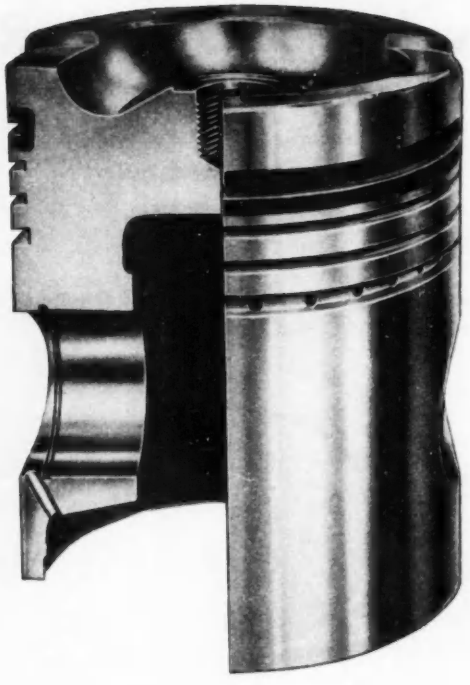
COTTA

HEAVY-DUTY REDUCTION UNITS

"Engineered-to-order"

One Secret of

INCREASED POWER
LOWER MAINTENANCE
LONGER ENGINE LIFE



A NI-RESIST INSERT . . .
bonded into aluminum alloy piston by the Al-Fin process.

Standard aluminum alloy piston which failed in the top ring groove.

ELIMINATE excessive failures from wear, burning and erosion in the ring area of aluminum alloy pistons . .

Particularly in the top ring groove . . . which encounters the most heat, receives the least lubrication, and faces wear from abrasive dust and dirt coming in through the intake.

A NI-RESIST® band gives the stop-sign to excessive ring groove wear and, thus, curbs unnecessary oil consumption and needless loss of power due to "blow-by."

Records show that these troubles end when the Al-Fin process for molecular bonding of aluminum to iron or steel is used to make Ni-Resist ring carrier bands an integral part of pistons.

Ni-Resist . . . a high nickel alloy cast iron . . . meets all demands for this application. It resists heat, corrosion, metal-to-metal wear and galling. Moreover, its high thermal expansion coefficient is close to that of aluminum alloy 142 and 132 ("Lo-Ex") to which it is bonded by the Al-Fin process . . . developed by Al-Fin Division of Fairchild Engine and Airplane Corporation, Farmingdale, L. I.

Rings operating in Ni-Resist bands are unable to chew their way into the ring bands, and service records show remarkable improvement in piston life, as well as higher power per cylinder.

United Engine & Machine Company of San Leandro, California, is one of several concerns in this country and abroad, licensed to manufacture bimetal products by the Al-Fin process. United's "Dualoy" bonded aluminum Ni-Resist pistons are now marketed as original equipment and replacements for both gasoline and Diesel engines in trucks, buses and tractors.

We welcome the opportunity to give you counsel and data on the use of Ni-Resist for this and other uses in industry.

EMBLEM OF INCO SERVICE

Over the years, International Nickel has accumulated a fund of useful information on the properties, treatment, fabrication and performance of engineering alloy steels, stainless steels, cast irons, brasses, bronzes, nickel silver, cupro-nickel and other alloys containing nickel. This information is yours for the asking. Write for "List A" of available publications.

THE INTERNATIONAL NICKEL COMPANY, INC.

67 WALL STREET
NEW YORK 5, N. Y.

AUTOMOTIVE INDUSTRIES

Published Semi-Monthly

July 1, 1950 Vol. 103, No. 1

Contents

High Spots of This Issue	15
News of the Automotive Industries	17
Men in the News	25
Calendar of Coming Events	25
Significance of the GM-UAW Contract. By Leonard Westrate	30
Manufacturing Advances at Ford's Canadian Plant. By Joseph Geschelin	32
Making Low and Reverse Bands for the Powerglide	36
Round Table Discussions Among Highlights of SAE French Lick Meeting. By James R. Custer	38
Dynaflow Brake Band Simplified and Improved. By Joseph Geschelin	42
Many Improvements in Ford Tractor Engine	45
Quick Reversal of Electric Motors	45
Design Analysis of Free-Piston Engines. By Prof. A. K. Oppenheim and Prof. A. L. London	46
New Production and Plant Equipment	51
New Products	54
Aircraft Products	56
Publications Available	60
Special Tooling Triples Ultramatic Pump Production Rate	68
Business in Brief	70
Advertisers' Index	96

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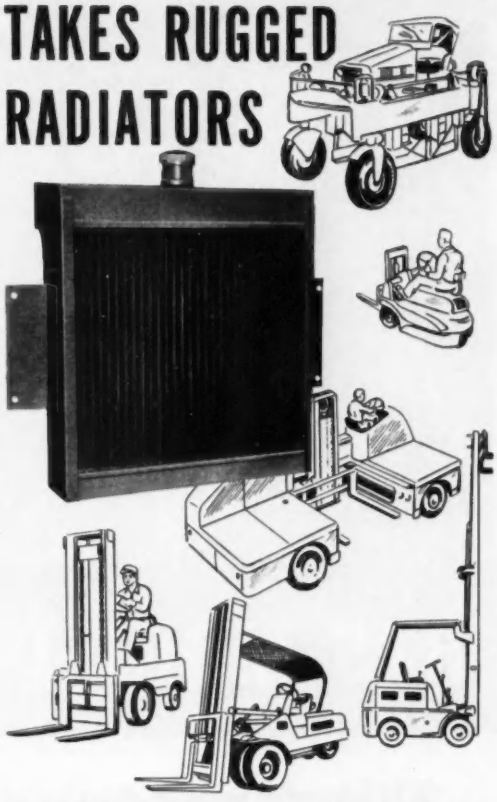
MATERIAL HANDLING TAKES RUGGED RADIATORS



TAILOR-MADE YOUNG DESIGN ASSURES OPTIMUM HEAT TRANSFER FOR LIFT TRUCKS

Many of the biggest names in the lift-truck business rely on Young for their radiator requirements. Thorough analysis of the cooling problems . . . such as heavy, intermittent lifting in heated atmosphere and accompanying stress and strain . . . results in the design and development of radiators especially suited to lift truck applications. Exhaustive testing, high-speed production and controlled quality assure reliable delivery of a product worthy of the Young Quality trade-mark. A Young Sales Engineer will gladly explain the design advantages of Young Radiators at your convenience.

YOUNG

HEAT TRANSFER PRODUCTS FOR AUTOMOTIVE AND INDUSTRIAL APPLICATIONS.

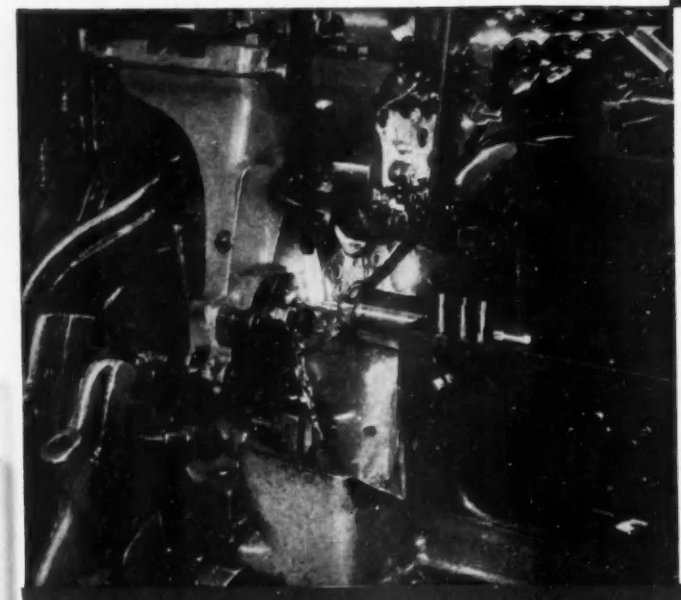
HEATING, COOLING, AND AIR CONDITIONING PRODUCTS FOR HOME AND INDUSTRY.

T.M. REG. U.S. PAT. OFF.

YOUNG RADIATOR COMPANY

DEPT. 100-G, RACINE, WISCONSIN

Plants at Racine, Wisconsin and Mattoon, Illinois



PART

Over-all length	1"
Stock Diameter	5/16"
Slot	1/4" deep x 5/16"
Head	5/16" dia. x 5/16" long
Small Diameter	1/4" x 23/32" long
Milled Flats	5/32" wide on 23/32" dia.

TOOLING

Davenport 5-spindle Model B

1st position	Form and Support
2nd position	Size (shaving tool) and Support
3rd position	Mill slot (Slotting saw 965 r.p.m. 2¼", 560 s.f.p.m.
4th position	Mill flats and Support
5th position	Radius, chamfer, cut-off (Cut-off tool .0025" feed)

DATA

Material	B-1113
Cycle	3 seconds
Spindle Speed	1930 r.p.m.

875 MORE PIECES per 8-hr. shift

This TEXACO user* also reduces unit costs two other ways

When *Texaco Cleartex Cutting Oil* was placed in service as the coolant on this job, the better cooling and lubrication that resulted showed up quickly in the reduced number of necessary tool grinds.

On the slotting saw, for example, four regrinds in 24 hours were reduced to three. Cut-off tool life was extended from two to six hours. In addition to these worth-while savings in regrinding costs, reduction in down-time enabled the machine to produce an extra 875 pieces per 8-hour shift.

These two factors—increased production and reduced tool maintenance—add up to lower unit costs.

Let a Texaco Lubrication Engineer specializing in machining operations help you make savings in your plant. *Texaco Cleartex Cutting Oil* is only one of a complete line of Texaco Cutting, Grinding and Soluble Oils designed to help you do your machining better, faster, and at lower cost.

Just call the nearest of the more than 2,000 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

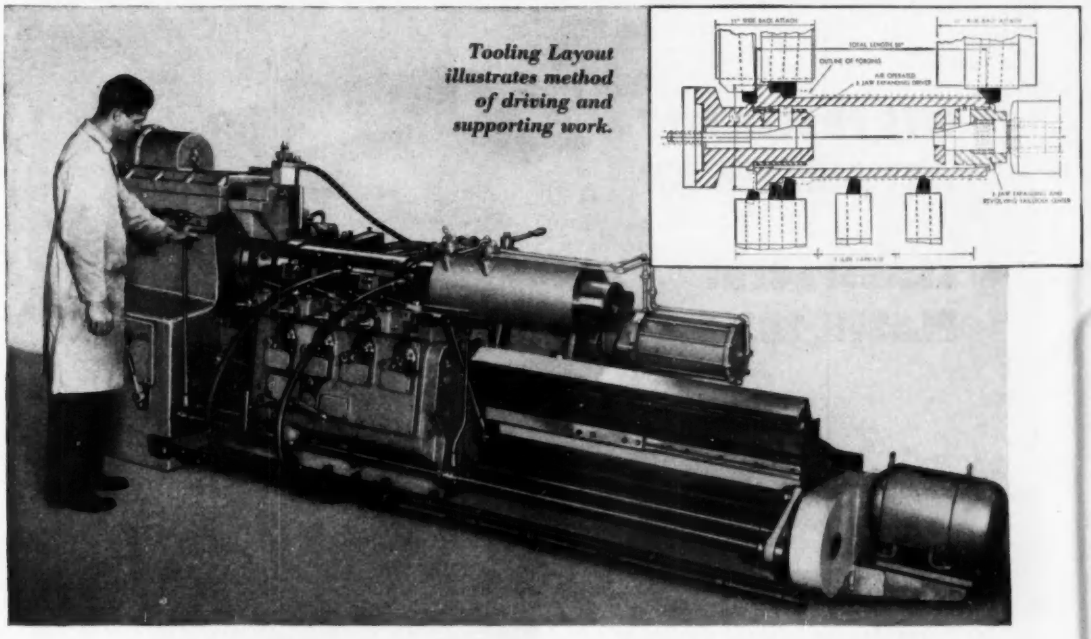
*Name on request

TEXACO

TEXACO CUTTING, GRINDING AND SOLUBLE OILS FOR FASTER MACHINING

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. **"THE Lo-swing PEOPLE"** SENECA FALLS, NEW YORK



Tooling Layout illustrates method of driving and supporting work.

NEW Lo-swing LATHE MACHINES
LARGE PUMP LINERS OF VARIOUS SIZES

Problem: To turn, square and chamfer large pump liner forgings, varying in size from 4" dia. x 10" long to 12" dia. x 30" long, on a single machine with a change of tools and drivers only.

Solution: The new Model "LS" Lo-swing Semi-Automatic Lathe was chosen for this job because of ease of change-over for various sizes, and its ability to transmit 100 H. P. to the cutting tools. Work comes to the machine with the bore rough forged. O. D. must be turned concentric with the rough bore. The piece is held at the headstock end by a 3-jaw, air-operated, expanding arbor, while the tailstock end is supported by a 3-jaw, expanding plug center, the jaws of which expand when the tailstock quill moves forward. Turning is accomplished with 5 tools mounted on the 3 front carriage slides. Shoulders are squared and chamfered with 5 tools mounted on 2 back-squaring attachments.

The New Model "LS" Lo-swing is designed to take full advantage of modern sintered carbide tools having tremendous capacity at high cutting speeds and coarse feeds, coupled with an ability to transmit up to 100 H. P. Other features include unlimited carriage travel, power feed to individually-controlled carriage cross slides, rapid traverse on all carriage and back attachment movements, etc. Write for Bulletin LS-50 describing this new lathe for heavy, multiple-tool turning.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing

new UNITED Chaff Pre-Cleaner

★ **FITS PRACTICALLY ANY AIR CLEANER**

★ **TRANSPARENT PLASTIC SHELL**

DUST LEVEL
UNITED PRE-CLEANER
IMPORTANT
THIS PRE-CLEANER DOES NOT ELIMINATE SERVICING OF THE OIL BATH AIR CLEANER, BUT PROLONGS THE SERVICE PERIOD.
EMPTY WHEN DUST LEVEL IS REACHED
REMOVE WING NUT ASSEMBLY AND LIFT PLASTIC BODY FROM BASE, SHAKE DUST FROM DIRT COMPARTMENT, AND REPLACE CLEANER.
UNITED SPECIALTIES CO., Chicago, Ill., U.S.A.
DUST LEVEL

Here is another new United development — a chaff pre-cleaner that can be easily attached to practically any center tube air cleaner installation. Designed with special fittings, this chaff pre-cleaner is adaptable to 95 percent of all wheel tractors, agricultural equipment and industrial power units.

Attached to the regular oil bath air cleaner, this unit assures maximum engine protection. It removes a large percentage of chaff, dust and linty materials from air before it enters the filter unit of the oil bath air cleaner. The pre-cleaner prevents clogging — keeps the air cleaner operating at top efficiency.

The outside shell of the pre-cleaner is made from durable, transparent plastic — the dirt pickup is visible to the operator at all times.

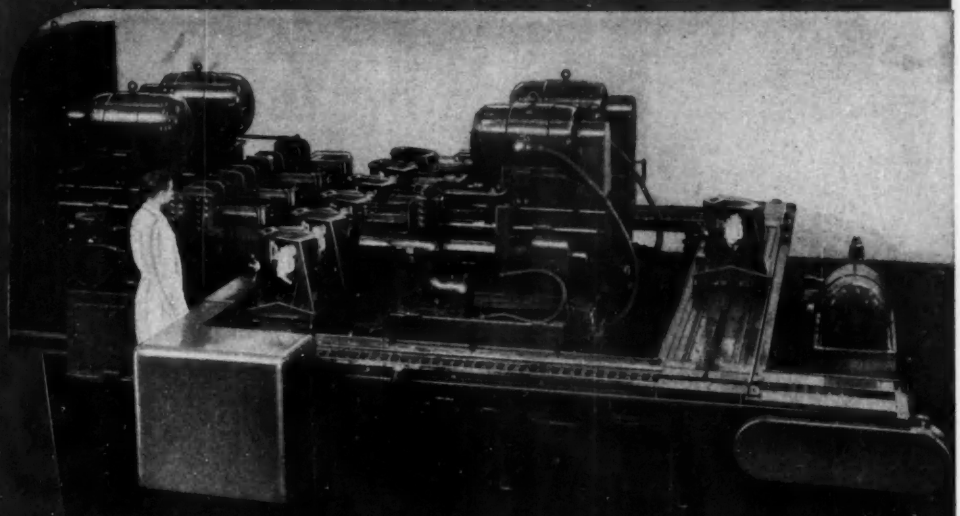
Pioneer builder of oil bath air cleaners, United offers over 260 air cleaner models — a size and type to fit any internal combustion engine. Inquiries regarding the new United pre-cleaner or any of our air cleaner designs will receive immediate attention.

UNITED SPECIALTIES COMPANY

United Air Cleaner Division, Chicago 28
Mitchell Division, Philadelphia 36

AIR CLEANERS ★ METAL STAMPINGS
DOVETAILS ★ IGNITION AND TURN
SIGNAL SWITCHES ★ ROLLED SHAPES

Another Transfer-matic by Cross



Drills and Bores Aircraft Cylinder Heads

- ★ 80 pieces per hour at 100% efficiency
- ★ 5 stations—1 loading, 4 cutting
- ★ Rough drills and forms valve pockets and spring compartments; finish bores valve guide hole, insert seat and spring seat
- ★ Palletized work holding fixtures with interchangeable adapters for holding four parts
- ★ Stub tools for drilling and forming—no drill or guide bushings
- ★ Coolant directed through spindles and tools to cutting points

THE **CROSS** CO.

Special MACHINE TOOLS

Statistical and Metallurgical Control Govern Quality of Eaton Valve Lifters

Eaton has developed outstanding facilities for the manufacture of valve lifters and associated parts.

Statistical Control of key operations provides a visual record of adherence to established limits.

The development of specialized types of chilled irons, and highly precise methods of metallurgical control, are important factors in Eaton quality.

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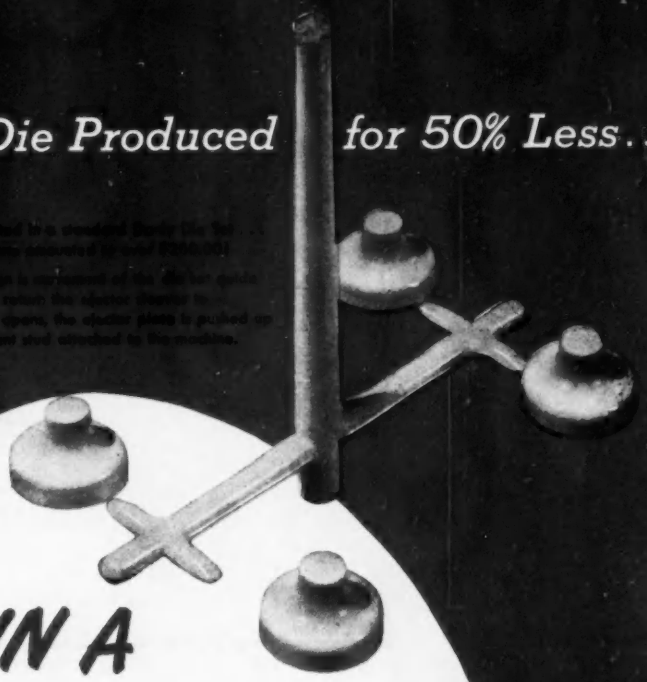
CLEVELAND, OHIO

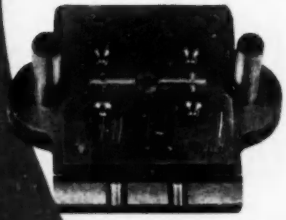
SAGINAW DIVISION: 9771 FRENCH ROAD • DETROIT 13, MICHIGAN

EATON PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

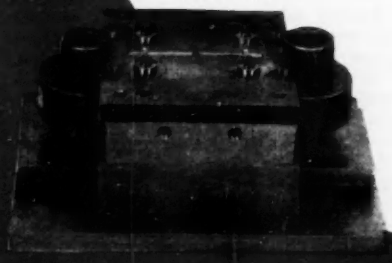
Plastic Mold Die Produced for 50% Less...



IN A DANLY PRECISION DIE SET



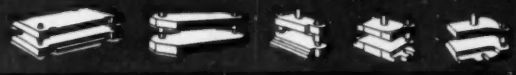
by Waite's Tool and Die Shop, Grand Rapids, Michigan



Danly precision makes every Danly Die Set a reliable base for the finest die work . . . even in special applications like this. They save time in the die shop because they are square and true . . . they assure longer production runs because precision die closure protects die components.

Standard Danly Die Sets are quickly available from a nationwide system of completely stocked assembly branches. Just 'phone for fast delivery, and for the finest in die set precision, always specify Danly!

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue,
Chicago 50, Illinois



DANLY®

PRECISION DIE SETS . . . STANDARD AND SPECIAL

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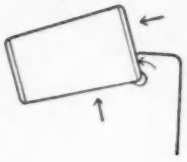
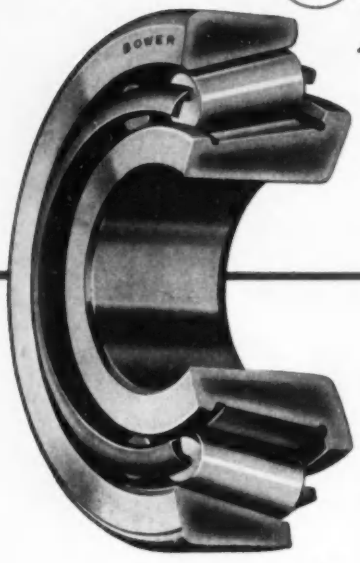
SPHER—Stands for generated spherical roll-head and flange surfaces.

SPHER-O-HONED

O—Stands for the liberal oil groove.



HONED—Stands for durable races honed to micro-inch smoothness.



means

Designed by Bower
Perfected by Bower
Precision-Built by Bower

Since it was first used by Bower to describe certain unique qualities in a roller bearing, the word Spher-O-Honed has gained additional important meanings. Basically, it means generated spherical roll-head and flange surface, liberal oil groove, micro-smooth races. Even more important, experienced manufacturers recognize that Spher-O-Honed stands for such outstanding bearing advantages as longer life, quiet, trouble-free service, no "running in" or "final" adjustment—to mention but a few. They know, too, that *only* Bower Spher-O-Honed bearings combine all these significant advantages. Next time you specify bearings for your product, be sure they are Bower Spher-O-Honed bearings—proved by almost universal application in the automotive, farm equipment and earth moving fields. They're your best bearing buy!

BOWER ROLLER BEARING COMPANY, DETROIT 14, MICHIGAN

BOWER

ROLLER BEARINGS

Because this message created such great interest, we're repeating it for you

May we EXPLODE an old theory on machining ?

Read what

ANTISEP A.P. BASE

is doing for others:

In 48 days a wheel manufacturer saved $341.60 on oil alone, with better tool life, no rust, no bearing wear, no parts too hot to handle.

•

Surface speeds up to 340 FPM were attained on an automatic machining large bearing races of 52100 steel. "Only oil having sufficient lubricating qualities," says the manufacturer.

•

Cost of machining air hose coupler reduced from 46¢ to less than 10¢ per gal. for Antisep solution. Work is cooler and cleaner.

•

A collet maker estimates Antisep Base on one automatic saved him $350 last year.

•

Tool life on forming tools has increased 100%, says a clamp maker. Production upped 15% since switching to Antisep Base.

We refer to the idea that a water-soluble oil should be used as the cutting fluid in automatic screw machines. A few years ago we might have agreed with that—but not now! There is *one*—and one only—which we would now recommend for automatics. That is ANTISEP All-Purpose Base. Solutions of that modern concentrate are being used all over industry in automatics, because it is proving more than satisfactory from every angle—cooling ability, safety, finish and speed.

The reason is that Antisep A.P. Base isn't just another water-soluble cutting oil. It has established an entirely new concept in machining. Here is a base oil with high fatty content, anti-welding characteristics, high film strength and excellent lubricating qualities. It may be used for 90% of all machining jobs, and it costs, in solution, less than 7 cents a gallon!

May we cite you authentic instances of where and how Antisep Base is out-performing former types of cutting fluids in automatics? We believe you'll then agree that we've busted an old tradition wide open. E. F. Houghton & Co., 303 W. Lehigh Avenue, Phila. 33, Pa.

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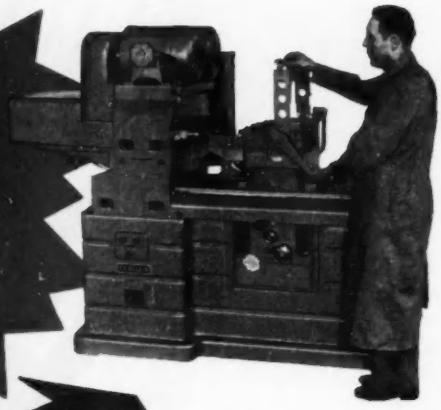
PRODUCTS FOR METAL WORKING

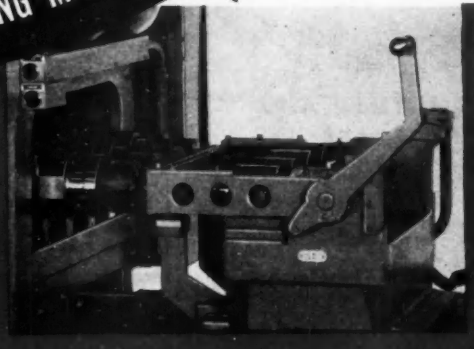
CUTTING OILS • QUENCHING OILS • HEAT TREATING SALTS • METAL CLEANERS
RUST PREVENTIVES • INHIBITORS • "FORTIFIED" LUBRICANTS • PACKINGS

8 SURFACES MACHINED ...1046 PIECES PER HOUR...

...ON EX-CELL-O PRECISION BORING MACHINE



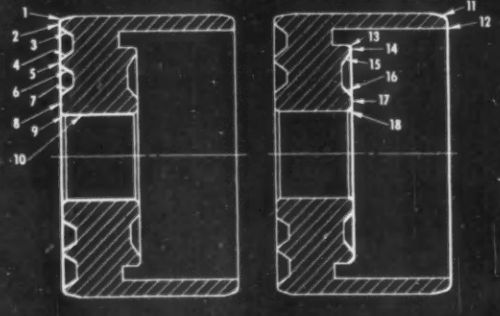
Operator placing pistons on loading pins. Movement of the loading lever controls the automatic machine cycle.



Two Style 112-C Ex-Cell-O Precision Boring Machines finish eighteen surfaces of the parts shown in the drawings at right below. One machine finishes 8 surfaces at the net rate of 1046 pieces per hour; the companion machine finishes 10 surfaces at the net rate of 640 pieces per hour. The parts are automotive shock absorber pistons, approximately one inch in diameter.

The spindles, four on each machine, operate continuously. Work loading equipment and automatic ejection of finished parts contribute to the extremely fast machine cycles.

Whether your work involves precision machining in large volume or in small lots you'll find that it's economical to use *standard machines* whenever possible. Ask your Ex-Cell-O representative for complete information on standard Ex-Cell-O Precision Boring Machines.



XLO

EX-CELL-O for PRECISION

50-20

EX-CELL-O CORPORATION DETROIT 32 MICHIGAN

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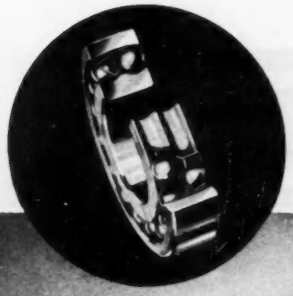
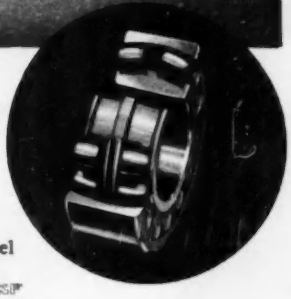
DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT



Heavy hauling's no problem when STERLING'S on the job



bearings engineered by SKF

Hauling 65-ton shovels is all in the day's work for heavy-duty units made by Sterling Motors Corporation, Milwaukee. Their dual-chain drive and three-in-one differentials eliminate wheel fight . . . let them roar over roughest terrain. In applications like these, bearings take a terrific beating but once again SKF demonstrates complete ability to withstand the heaviest punishment. Dependability and ability to "take it" are inherent in all SKF Ball and Roller Bearings. They are the natural result of SKF's intensive research, engineering skill, strict standards of manufacture and rigid inspection of the finished product. The advice of SKF Engineers may be helpful to you when you design equipment for extra-rugged duty. **SKF** INDUSTRIES, INC., PHILADELPHIA 32, PA., *the Pioneers of the Deep Groove Ball Bearing, Spherical Roller Bearing, Self-Aligning Ball Bearing.* 7081

SKF

BALL AND ROLLER BEARINGS

8 REASONS WHY SKF IS PREFERRED BY ALL INDUSTRY

Integrity — Craftsmanship — Metallurgy — Tolerance Control

Surface Finish — Product Uniformity — Engineering Service — Field Service

Bendix Products Division

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THE WORLD'S FASTEST SELLING POWER BRAKE

Every day more and more commercial vehicle operators are turning to Hydrovac* as the final answer to their power braking problems. This unrivalled preference presents to manufacturers, whose vehicles are factory equipped with Hydrovac, a pre-sold market of vast proportions. Further, the millions of Hydrovac units in daily use furnish a potential service and replacement business that any alert dealer organization would welcome.

There is an added sales feature for the commercial vehicle manufacturer who standardizes on Hydrovac—the best proven and *most* popular power brake in the world.

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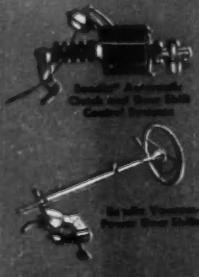
BUILDERS OF THE BASICS OF BETTER MOTOR VEHICLES



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AUTOMOTIVE INDUSTRIES
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High Spots of This Issue

★ **Significance of the GM-UAW Contract**

In the precedent-setting GM-UAW contract, pensions, insurances, wages and all economic and contract issues have been worked out for a term of five years. This article analyzes two very forward-looking and optimistic indications of the pact. It also includes an admirable at-a-glance comparison of company-paid pension plans at GM, Ford, Chrysler and Nash. See page 30.

★ **Advances at Ford's Canadian Plant**

This study concerns a sampling of some outstanding operations of recent origin at Ford in the continuing interests of modernization and cost economy. Among installations described and illustrated are Fellows planetary gear shapers, Sundstrand automatic lathes, Minster and Clearing presses, a two-way Barnesdril machine, and developments with a four-head Mattison grinder. Page 32.

★ **Making Low and Reverse Bands for the Powerglide**

At the Moraine Products Division of GMC special techniques are employed in producing important parts for the Chevrolet automatic transmission. This fourth article in a series devoted to the production of the Powerglide details band manufacture. Page 36.

★ **SAE French Lick Meeting**

Twelve round-table technical sessions devoted to timely engineering problems were of great interest to the record overflow crowd of 1400 attending this summer's SAE meeting. Discussed and demonstrated were automatic transmissions; power-assist steering; wear of pistons, rings, cylinders; higher voltages for automobiles; etc. For important extracts from a number of the papers there presented, turn to page 38.

★ **Design Analysis of Free-Piston Engines**

Stanford University has been performing research work on a free-piston engine for the Navy Dept. Office of Naval Research. This article is based on the first major report released since outset of the program. Renewed interest in development of the engine is due to recent successful German and French applications. The report begins on page 46.

★ **21 New Product Items And Other High Spots, Such As:**

Simplification and improvement of the Dynaflow brake band; quick reversal of electric motors; improvements in the Ford tractor engine; and how special tooling triples the rate of Ultramatic pump production.

News of the Automotive Industries, Page 17
For Complete Table of Contents, See Page 3

HOW TO BEAT THE SHELL GAME of Machining Operations

Part name	Bearing
Operation	Broach joint face
Material	Steel, babbit lined
Stock removal	1/32" max.
Production	315 per hour
Equipment	CINCINNATI No. 1-30 Single Ram Vertical Hydro-Broach, equipped with automatic fixture

CINCINNATI

New catalog just off the press, No. M-1709, contains complete data for No. 1-30 Single Ram (illustrated) and Duplex Hydro-Broach Machines. Write for a copy.

Shell-like parts are hard to machine. Even under light cuts, they tend to twist or crush. The only way to successfully handle work of this type is to completely support and clamp the parts on every surface except the one to be machined. ¶Cincinnati Application Engineers employed this principle to broach the joint face of babbit and bronze lined steel bearing shells. A CINCINNATI No. 1-30 Single Ram Vertical Hydro-Broach Machine, illustrated above, was tooled up for the operation. Notice how completely the work is supported and clamped—on the entire half-circle. To reduce manual effort and maintain a high rate of low cost production, the fixture is clamped and unclamped automatically, and the surfaces to be machined are automatically equalized. ¶This example is typical of Cincinnati application engineering for low cost, high quality production. Whether you are expanding your facilities or replacing equipment, it will pay you to come to Cincinnati Milling first. May we hear from you?

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MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES
FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

News of the AUTOMOTIVE INDUSTRIES

Vol. 103, No. 1 July 1, 1950

No Radical Model Change Planned for 1951 Ford

The 1951 model Ford will not be radically different from the present one when it is introduced late this year. It now seems likely, however, that one of the features will be availability for the first time of the long-awaited automatic transmission. Production of the unit will get under way slowly next month at Borg-Warner's Muncie, Ind., plant with initial production reserved for Mercury, and it is highly doubtful that enough of the units will be available to be offered on Ford until very late this year.

K-F Starts Production on Two More Models

Kaiser-Frazer went into production late in June on the first two-door sedan in its history, and also started production of the lower-priced car, the Henry J. A three-passenger coupe will come into the line this month, and the Traveler, utility sedan, will probably follow in August. K-F also started installation of Hydra-Matic drives on the Kaiser and Frazer lines in June on a limited basis, and will expand its use as soon as more units become available. Reception by the public of the new Kaiser line has been exceptionally good, and K-F is again in the happy situation of seeing its order backlog considerably ahead of its production capacity. Schedules are being increased by 30 per cent, and a nine-hour work day is in force. June schedules call for nearly 17,000 units, 81 per cent ahead of the same month last year.

Studebaker Gives Pensions Similar to GM Plan

Studebaker Corp. has concluded a pension agreement with the UAW-CIO very similar to that granted by GM. It guarantees monthly pensions of $100, including primary social security benefits, to workers retiring at age 65 with at least 25 years of service. Workers with 10 to 25 years of service get a minimum of $4 a month for each year of service. In normal retirement cases, Studebaker guarantees to pay at least $1.50 a month for each year of service up to 30 years, so that pensions would be increased above the $100 level in the event of an increase in social security payments. Normal retirement age is 65, but employes can continue to work until they are 68. If ratified by stockholders and employes, the pension agreement will go into effect no later than Nov. 1 of this year, with no compulsory retirements until Jan. 1, 1952.

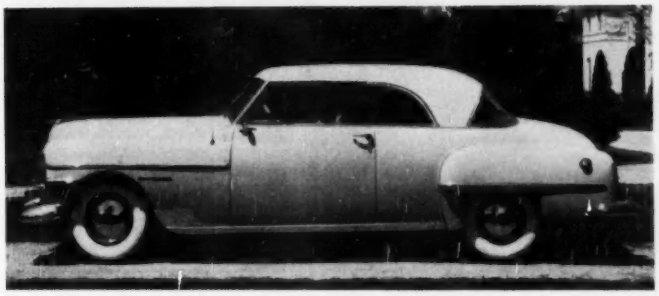
Nash to Have Hard Tops in 1951 Rambler Line

It now seems quite certain that when Nash introduces its 1951 models this fall, it will include sedan and coupe models in its Rambler line. Reliable reports also say that on next year's models, the Ambassador and Statesman series will not be as similar in exterior styling as they are in the current models. It is believed that the company would like to have more distinction between the two lines to set the Ambassador line distinctly apart from its lower-priced companion, the Statesman.

Mack Unveils New Models

At its Allentown, Pa., plant, Mack Trucks, Inc., recently unveiled the first of a new series of "A" models in the lower-weight end of its line. The event as well as the new models marked the first of a series of activities planned in conjunction with Mack's Golden Anniversary year. The new models will cover a range from 17,000 lb GVW to 45,000 lb GCW. Design is adopted from existing designs used on the "L" line. Three brand new gasoline engines made entirely in the Mack factory, will power the new units. Basic engine specifications are as follows:

Size in cu. in.	Hp @ rpm	Torque in lb-ft
290	107 @ 2800	232 @ 1400
330	122 @ 2800	264 @ 1400
337	140 @ 2800	302 @ 1400



NEW YORKER IN NEWPORT

Chrysler is now making its Newport hardtop convertible models available in the Windsor and New Yorker (shown here) lines. Combining a permanent all-steel top and convertible lines, the Newport features a Clearboc rear window which folds into the top for maximum rearward vision, and side windcw arrangement which permits side windows and window frames to be rolled completely out of sight.

Saginaw Steering Developing Power Steering Unit

GM's Saginaw Steering Gear Div. now has a power-assisted steering unit under development. Currently being tested, the unit operates hydraulically at pressures up to a maximum of 750 psi. It has been installed for test purposes on a Buick Roadmaster model. The manual steering effort is said to remain constant.

Dodge Introduces New Model Hard Top Convertible

Chrysler Divisions are rapidly taking to "hard top" styling. Dodge Div. is now producing a hard-top model which

it has named the Diplomat. Chrysler and De Soto Divisions also have such cars, and in addition Chrysler has extended the hard-top styling to the New Yorker and Windsor lines. It is understood that Plymouth will have such a model soon.

Hudson Offers De Luxe Pacemakers

Priced at $15 to $25 above the standard series, de luxe models of Hudson's Pacemaker series are now being offered. Available in four body styles, the new models include added chromium-plated decorations inside and out, a de luxe steering wheel, arm rests for front and back seats, upholstered door panels, and a dual horn.

Wide World

HIGH STANDING MULE

Designed for use in fields of tall crops, this 10-hp agricultural machine is shown being checked by R. J. Dykes, executive vice president, Dykes Iron Works, Miami, Fla., with Mardelle Dukes, treasurer, aboard. The company cooperated with the University of Florida experiment station at Belle Glade in producing the machine which is called the Everglades Mule.

Crosley Cuts Prices on All Models

Price cuts ranging from $63 to $86 on all passenger cars, both super and standard, and all commercial models, have been disclosed by Crosley Motors, Inc.

See Record Vehicle Output This Year at Current Pace

If automobile and truck builders turn out as many cars and trucks in the remaining six months of this year as they did in the first half, the industry will hang up a phenomenal record of more than 7.4 million vehicles in 1950. June's production will hit a new all-time record, and is being estimated at between 815,000 and 820,000 units. The outlook for July is that output may decline a little because of the holiday, but August's output will probably surpass June's total. During the first six months of this year production from U. S. plants is estimated at 3,725,000 units comprising 3,082,000 passenger cars and 645,000 trucks. Production is currently banging along at more than 200,000 vehicles a week, and schedules will be pushed even higher if possible.

GM's projected schedules during the third quarter are the highest in history. Ford and Chrysler are also at very high levels, Chrysler having surpassed its previous peak several weeks ago when it was turning out more than 8000 vehicles a day. Ford is also at the highest point in more than 25 years, being surpassed only back in the boom days of the early '20's when Ford was the number one producer. Kaiser-Frazer, Nash, Hudson and Studebaker are also pushing assembly lines at top speed.

How long sales will keep up with the blistering production pace is anyone's guess, but currently the more popular makes are not available for immediate delivery to customers and many require a wait running up to several weeks. Dealer stocks are at a very low ebb, and it will take some time even after sales slow up to get inventories at the dealer level into satisfactory condition. At any rate, optimism is running very high with many industry leaders predicting that the strong demand will extend through all of this year and well into 1951.

Eaton Opens New Plant in Canada

The new $1.5 million plant of Eaton Automotive Products, Ltd., was recently opened in London, Ont., Canada. The first automotive parts production center to be established in London, it is a subsidiary of the Eaton Manufacturing Co. of Cleveland, O. It will have an initial payroll of about $400,000 annually. The plant will supply car heaters, tappets and screw machine products to automotive plants in Windsor, Tilbury, Oshawa and Hamilton, as well as industrial spring washers and spring lock washer assemblies to other manufacturers.

Reo Canadian Plant to Build K-F Cars

Kaiser-Frazer of Canada Ltd. and Reo Motors, Inc., have concluded an agreement under which Kaiser cars will be assembled at the Reo Canadian subsidiary near Toronto. K-F will underwrite the tooling costs for production of 10 cars per eight-hour shift with Reo supplying labor and plant facilities. Normal output of Reo trucks and buses will continue at the plant. Canadian government regulations require extensive use of Canadian parts, labor and materials in vehicles assembled in Canada. Production will start in late July and will reach capacity toward the end of August. K-F has 165 dealers and distributors operating in Canada.

T. A. Farrell Made Head of Dearborn Motors

Thomas A. Farrell has been named president of Dearborn Motors Corp. to succeed Frank R. Pierce who died May 25 from injuries suffered in an airplane crash. Mr. Farrell was previously vice president of the company. At the same time the board of directors announced several other appointments and promotions. Merritt D. Hill, formerly gen-

eral sales manager, was made a vice president and director. G. D. Andrews was promoted from assistant general sales manager to vice president in charge of sales. Ralph E. Hunt, previously manager of the engineering and manufacturing division, was appointed vice president in charge of engineering and manufacturing. I. R. Kappler and James F. Pedder also were made vice presidents in charge of purchasing and advertising respectively. Other promotions were L. H. Pomeroy to assistant general sales manager from Western sales manager; Joseph B. Legler from national service manager to Western sales manager, and Frank W. Conover from assistant service manager to national manager.

HEADED WESTWARD

This new Sterling Motor Corp. model TG2105D cab-over-engine chassis, intended for a West Coast operator, is equipped with a Cummins 200-hp engine. Known as the "TG" series, the new models supplement the "TE" series cab-forward type chassis. These new chassis are available with single or tandem rear axles, multiple transmissions in vehicles of sufficient wheelbase, and Diesel engines ranging from 150 to 300 hp.

Export Trade Improving With Latin America

Possibilities of trade with Latin America are considerably improved, according to Marcell F. DeMuller, president, Willys-Overland Export Corp. He said that because the dollar gap is narrowing slowly between the two countries the imbalance in trade is trending toward adjustment and American aid, particularly Export & Import Bank loans to Chile and Argentina, is stimulating trade. He said that between 1947 and 1949, the trade deficit of Latin America with the U. S. declined from $1.7 billion to $400 million. He also said that the expected influx of European cars in the sterling bloc countries has not materialized, and that these countries are increasingly stepping up their American trade despite devaluation of the pound sterling. He added that during May, Willys orders for Jeeps and Jeepsters from Latin American countries were the largest since June, 1949.

GM to Revise Pensions for Salaried Workers

GM later this year at a special meeting will submit a plan to stockholders calling for revision of the company's retirement program covering all salaried employes. It is understood that the revision is being made in line with GM's policy of extending economic benefits to salaried employes following similar action to hourly-rated workers.

Superior Coach to Build New Plant in Mississippi

Plans to build a new manufacturing plant in Kosciusko, Miss., have been announced by John H. Shields, president, Superior Coach Corp., Lima, O. The new plant will be known as the Pathfinder Coach Div. and will specialize in the building of Pathfinder Safety School Coaches. Later, this division will also become the hub of operations for other domestic and export buses. The factory will cover approximately 150,000 sq ft on a 50-acre property. The present timetable calls for its opening early in 1951.

European

LLOYD IS LOWEST

Recently exhibited at the International Automobile Show in Berlin, the new Lloyd, shown here, is described as Germany's lowest-priced car. Powered by an 18.3-cu in., 11-hp engine, the car seats four persons, weighs about 870 lb, and costs 2800 D-Marks.

Military Announces More Contracts

The Department of the Army has announced the award of the following contracts for automotive spare parts: The Autocar Co., Ardmore, Pa., $109,331; Willys-Overland Motors, Toledo, O., $544,242; Armstrong Rubber Co., West Haven, Conn., $1,157,036; Mohawk Rubber Co. Akron, O.; $458,523; Dayton Rubber Co., Dayton, O., $163,961; Denman Rubber Mfg. Co., Warren, O., $617,751; Goodyear Tire & Rubber Co., Akron, O., $2,085,384; Mansfield Tire & Rubber Co., Mansfield, O., $131,918, and Delco Products Div. General Motors Corp., $169,842. The Murphy Diesel Co., Milwaukee, Wis., received a spare parts contract totaling $139,358.

Willys-Overland has also been awarded a $1.5 million military contract for Jeep engines. Shipments will start soon on the order which calls for more than 6000 engines.

1950 NEW TRUCK REGISTRATIONS*

Arranged by Makes in Descending Order According to the 1950 Four Months' Totals.

Make	January	February	March*	April*	Four Months 1950*	Four Months 1949*
Chevrolet	22,763	24,629	31,443	33,459	112,294	105,630
Ford	17,756	19,788	25,810	26,424	89,778	81,438
International	5,883	6,510	8,185	8,240	28,818	29,502
Dodge	8,306	7,236	6,562	4,721	26,824	36,056
G.M.C.	5,067	5,767	7,175	7,515	25,524	23,107
Studebaker	3,497	3,502	3,997	3,703	14,699	17,704
Willys-Truck	843	772	857	895	3,367	8,213
Mack	821	708	778	778	3,085	1,942
White	633	681	909	858	3,081	2,775
Willys-Jeep	592	568	652	671	2,483	6,124
Diamond T	411	370	454	485	1,720	2,041
Divco	269	242	283	340	1,134	1,172
Reo	258	222	261	253	994	1,493
Autocar	113	128	141	285	667	704
Brockway	154	141	186	185	666	561
Pontiac	147	137	161	170	635	70
Federal	101	83	80	101	365	471
Crosley	40	32	38	36	146	379
Kenworth	32	18	46	45	141	146
F.W.D.	40	24	22	20	106	150
Sterling	23	20	33	26	102	72
All Others	177	140	143	137	597	1,167
Total	67,925	71,696	88,236	89,347	317,206	290,916

* Does not include reports from Tennessee for March and April.
† Data from R. L. Polk & Co.

Inflation Puts Pressure on Automobile Prices

Although GM president C. E. Wilson has indicated that automobile prices will not be raised as a result of the new GM labor contract, estimated to cost the company about 15½ cents an hour, manufacturers' costs are going up, and if the current inflationary trend continues, it will not be surprising to see some price increases on automobiles before the end of this year. For companies other than GM labor costs have increased 10 cents an hour where contracts have been signed, and it will be at least that much for those who still have to write agreements with the union. On top of that, material costs are trending upward again, and when suppliers have to increase wages or give pensions and insurance benefits, which amount to the same thing, the pressure for higher prices will be intensified.

The automobile manufacturers have counted on unprecedented high volume and increased efficiency to absorb at least part of the increased labor and material costs, but how much more pressure they can stand is an open question. The problem is a particularly bleak one for the small manufacturers who cannot stand the pressure of a 10 cents an hour labor cost increase nearly as well as Chrysler or Ford, or the 15½ cents granted by GM. Present indications are that automobile prices will not be increased immediately, but whether they can be held at present levels for the rest of this year will depend a great deal upon the course of the national economy and the extent of inflationary price movements in other lines.

1950 NEW PASSENGER CAR REGISTRATIONS*

Arranged by Makes in Descending Order According to the 1950 Four Months' Totals.

Make	January	February	March*	April*	Four Months 1950*	Four Months 1949*
Chevrolet	84,887	99,270	118,928	119,631	422,716	215,807
Ford	70,654	80,801	105,049	102,292	358,796	241,403
Buick	28,048	33,101	46,826	46,934	154,899	106,548
Pontiac	27,227	30,573	37,675	36,505	131,980	76,511
Oldsmobile	19,592	26,593	33,861	31,816	111,862	70,129
Mercury	17,551	20,417	28,341	28,406	94,714	48,953
Studebaker	14,404	20,866	28,903	28,956	93,129	49,667
Plymouth	43,407	29,006	12,723	4,894	90,030	134,000
Dodge	23,684	17,762	10,432	4,301	56,179	63,078
Nash	7,584	9,213	14,217	17,871	48,885	39,424
Hudson	9,159	8,942	12,412	13,650	44,163	46,471
Chrysler	12,090	8,968	4,928	2,277	28,280	35,949
Packard	4,146	4,540	6,578	7,680	22,944	28,746
Cadillac	2,737	3,843	7,537	7,673	21,790	25,293
De Soto	8,420	6,636	3,570	1,623	20,249	26,976
Kaiser	2,556	2,407	3,313	2,887	11,163	15,419
Lincoln	1,868	2,394	2,838	2,979	10,069	13,202
Willys	1,820	1,808	2,181	2,228	8,037	7,791
Frazer	412	395	406	1,831	3,044	7,983
Crosley	519	559	555	478	2,111	4,207
Austin	444	507	550	499	2,000	883
British Ford	73	70	89	100	332	2,129
All Others	290	329	403	487	1,509	1,921
Total	381,562	406,990	482,312	465,997	1,738,861	1,286,188

* Does not include reports from Tennessee for March and April.
† Data from R. L. Polk & Co.

Oldsmobile to Have Leaf Springs In Rear on Next Model

Reliable reports indicate that Oldsmobile will adopt leaf springs for its rear suspension on its 1951 models. Currently, Oldsmobile is using coil springs on all four wheels. The swing back to leaf springs for the rear suspension is a reversal of a trend in the industry over the past few years which saw several companies abandoning the leaf spring in favor of the coil spring.

Cars Account for Half of Instalment Credit

Automobile instalment credit at the dealer level accounted for about half the increase of $242 million in instalment credit during April, the Federal Reserve Board reports. Total consumer credit rose $345 million and stood at $18,629 million at the end of April.

Automobile finance credit in April advanced $123 million over March, bringing the total outstanding to $3478 million, $1237 million higher than at the end of April, 1949. The amount of automobile credit outstanding in relation to the total national expendable income, however, is still below the ratio prevailing in 1941.

Fruehauf Trailer Volume Hits Record Level

The truck-trailer business is booming right along with sales of trucks. During May, new orders received by Fruehauf exceeded sales by $600,000 and June business was substantially greater than May. Business has been increasing steadily month by month since January, and new orders for the first five months of this year totaled $44,250,000, a record high level. Net sales for the period were $40.6 million. The company has been able to reduce the amount of its bank loans during May by $1 million, leaving only $2 million still outstanding in notes. The company is expanding its Canadian operations with a new branch planned for Toronto and enlargement of the Montreal branch. Fruehauf has also sold its

Nashville and Memphis factory sales and service branches to separate companies and has leased them from the new owners on a long-term basis. A new plant with 67,000 sq ft of floor space at Memphis, the second one there, has been opened for building aluminum and some steel and flatbed trailers.

Revise Standard for Car Safety Glazing Materials

The American Standard Association has anounced a revision of the American Standard Safety Code for Safety Glazing Materials for Motor Vehicles (A26.1-1950). The scope of the standard code has been broadened to cover the use of plastic materials, as well as laminated safety glass, heat-treated glass, and wire glass. These materials are permitted in certain specified positions on motor vehicles, which include passenger automobiles, buses, trucks, taxicabs, motorcycles, and house trailers. Multiple glazed units are also covered for the first time. The newly revised code describes 25 tests for glazing materials, 16 more than were in the original 1938 code, and indicates their application in nine classes of use on motor vehicles.

Excise Taxes May Be Cut on Automobile Parts

Although a reduction of the Federal excise tax on motor vehicles appears to be doomed for this session of Congress at least, the levy on automobile and truck replacement parts and accessories may be cut if the current tax bill now under consideration goes through. After holding out little hope for action on parts and accessories, the committee recently voted to reduce the excise tax on those items by 1½ per cent making the new rate 3¾ per cent. At the same time the excise on tires has been cut to 3¾ cents per pound and on inner tubes to 6¾ cents per pound. The cuts are expected to carry through Congress, but there is some doubt that the complete tax bill will be finished before Congress adjourns, and there is also the possibility that the President may veto it.

GM Shareholders Asked to Approve Stock Split

If shareholders of GM approve the proposed two-for-one split of common stock later this year, GM's outstanding shares will be the highest by far of any company in the world—more than 88.2 million. At the end of March, GM common stockholders numbered nearly 403,000.

Magnetic Clutch Still Under Development

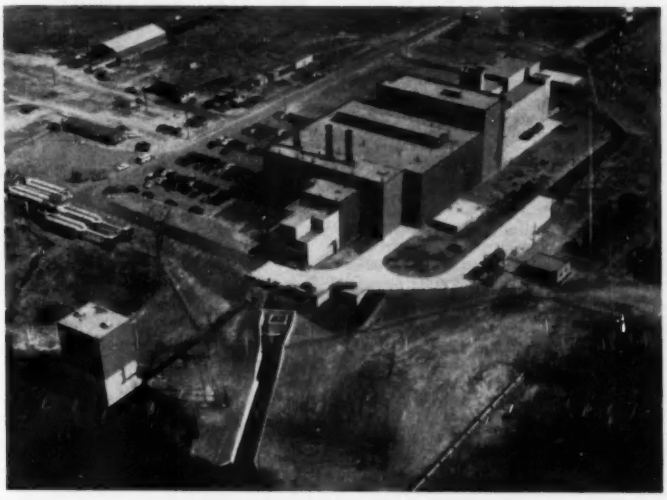
Not much has been heard recently of the magnetic clutch developed by the U. S. Bureau of Standards. It is understood, however, that interest in the development is still very much alive and it is reported that Vickers has obtained development rights under license from the government, although it is not known whether the rights are exclusive.

Chrysler Division Makes Unusual Safety Record

Chrysler Division has hung up a remarkable industrial safety record. The division, during the last five years, has worked nearly 127 million man-hours without a single accidental death or permanent disability occurring on the job. In addition, severity rate of accidents was only one-tenth the national average, and frequency rate was only a third of the national average. The Chrysler division industrial safety program is headed by Oscar F. Lehman, safety engineer since the first Chrysler car was built 26 years ago.

Bell Has New Supersonic Airplane

Bell Aircraft Corp., whose X-1 was the first plane to fly faster than the speed of sound, has a new supersonic aircraft, the X-5, that is out of the design stage and which will be ready to take to the air this fall. Unlike the X-1, which is rocket-powered, the X-5 is a turbo-jet plane. In appearance, it will more closely resemble a tactical airplane than the X-1. The speed of the X-5 will be about the same as the X-1. The original X-1 has been flown at approximately 1000 mph. Improved models, designated the X-1A's, have more efficient fuel systems and are designed to fly at 1700 mph.



SCHEDULED FOR THE SUMMER

Scheduled to go into full operation this summer, the $12 million Andrew Willgoos Turbine Laboratory, shown above, at the Pratt & Whitney Aircraft Div., United Aircraft Corp., East Hartford, Conn., is said to be the largest privately-owned jet research facility in the world.

AMA Retains Mason as President

George W. Mason, president of Nash-Kelvinator Corp., has been re-elected president of the Automobile Manufacturers Association. All other officers were re-elected. They are: H. S. Vance of Studebaker and E. J. Bush of Diamond T as vice presidents; M. E. Coyle, GM, secretary; Hugh J. Ferry, Packard, treasurer; Alfred Reeves, advisory vice president, and William J. Cronin, man-

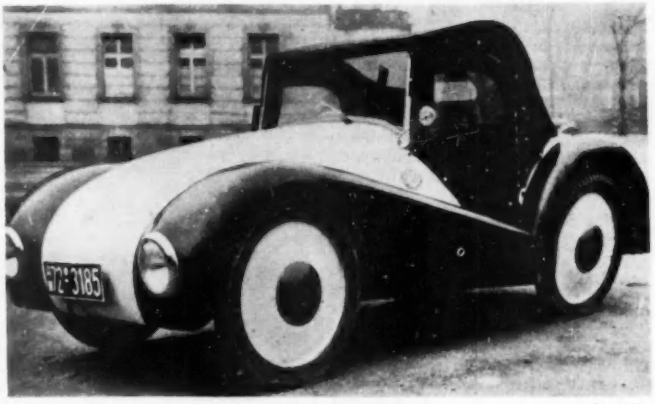
aging director. E. D. Bransome, Mack Trucks, Inc., and Mr. Ferry were elected to fill out the unexpired terms of George T. Christopher and C. T. Ruhf, former directors.

De Soto Adopts Waterproof Ignition System

De Soto Div. of the Chrysler Corp. has adopted a waterproof ignition system as standard equipment on all its cars. The system is similar to that adopted by Chrysler Div. last year. It consists essentially of metal and rubber seals around spark plugs, waterproof rubber covering on ignition wiring, waterproof construction of distributor and coil, and rubber caps for all wiring terminals.

Black Most Popular Color for Cars

Despite reports by various individual companies from time to time that colors other than black are most popular with their buyers, on a coast-to-coast overall basis, black is still the most popular color demanded by automobile buyers, according to the Automobile Manufacturers Association. In certain sections of the country, principally the far west, brighter colors are more popular than black, but in other areas, such as New England and the midwest, black is the most popular color by a considerable percentage. Two-tone cars are increasing in popularity, and one company reports that 20 per cent of its total output is devoted to two-tones.



ECONOMICAL SPORT

This new German sports car, the Champion, is powered by an engine with a piston displacement of about 15 cu in., developing approximately 7 hp. The car has a speed of about 50 mph.

President's Convertible Has Disappearing Step

Ford's Lincoln-Mercury Div. has delivered to the White House the last of a fleet of 10 special Lincolns leased to the government for White House use. The last car is a custom built convertible. A amusing sidelight is that the car is equipped with special disappearing steps on each side of the rear fenders for secret service men. The first cars built for the fleet were equipped with running boards which caused considerable chagrin when it was found that they were too wide for several Washington entrances.

EIGHT-BLADED SHARK

The Navy's new Douglas A2D Skyshark attack bomber shown above is powered by the new T-40 Allison twin turbo-prop engine driving two Aeroproducts counter-rotation propellers, augmented by jet thrust through the tail pipe. This plane recently successfully completed its first test flight.

Gar Wood Buys National Truck Equipment Company

Gar Wood Industries, Inc., recently purchased the National Truck Equipment Co., Waukesha, Wis. This property will be owned and operated by a newly-formed and wholly-owned subsidiary of Gar Wood, to be known as the National Lift Company. Through its new subsidiary, Gar Wood Industries now makes available equipment especially designed for trucks one ton and under.

Society for Quality Control Names New Officers

Newly elected officers of the American Society for Quality Control for the fiscal year beginning July 1, 1950, are: president, Wade R. Weaver, Director of Quality Control, Republic Steel Corp., Cleveland, O.; vice president, Martin A. Brumbaugh, Director Department of Statistical Analysis, Bristol Laboratories, Inc., Syracuse, N. Y.; ex-

ecutive secretary, Simon Collier, Director of Quality Control, Johns-Manville Corp., New York City; and treasurer, Alfred L. Davis, Evening and Extension Div., Rochester Institute of Technology, Rochester, N. Y.

Studebaker to Build Assembly Plant in New Jersey

Studebaker will start construction soon of a new $5½ million passenger car assembly plant near New Brunswick, N. J. The company has bought a 165-acre site in North Brunswick township, three miles south of New Brunswick, and contracts have been let for the 400,000 sq ft plant which is expected to be ready for operation by next March 1. Capacity of the plant will be 85,000 passenger cars a year and employment at the outset will be 2500 persons. In addition to complete passenger car assembly, bodies will also be assembled, painted and trimmed there. Engines, stampings and other components will be shipped from the main South Bend operation, requiring increased employment at the home plant.

Detroit Diesel Announces New "110" Engine

The long-awaited announcement of the "110" Diesel engine has been made by GM's Detroit Diesel Div. Although originally planned as a light-weight aluminum structure engine, the production version is of cast iron for major elements. It is being groomed specifically for railcar use, for large earth moving vehicles, and general industrial, marine and oilfield equipment. The "110" model is of two- stroke type, the same as the well-known "71" series engines, has a bore and stroke of 5 by 5.6 in., displacement of 660 cu in., and has a maximum rated output of 275 hp at 1800 rpm. Normal rated bhp with standard equipment is 254 at 1800 rpm. Maximum torque is 834 lb ft at 1200 rpm. The engine is equipped with a new gear driven centrifugal blower mounted at the rear above the flywheel. Cylinder sleeves are of dry type.

Crude Rubber Price Dips As Synthetic Steps Up

A downward trend in natural rubber prices which started in June emphasizes again the important influence of American synthetic rubber plants on world rubber prices. Following pleas from the rubber industry, the government announced plans to step up synthetic rubber production in this country, with the result that prices of crude rubber which had more than doubled since last fall soon started to skid. The high price of natural rubber has already resulted in increases for passenger car and truck tires and inner tubes made from natural rubber.

Buick Names A. H. Belfie General Sales Manager

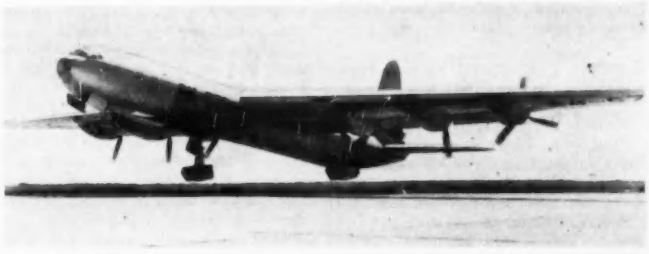
A. H. Belfie has been appointed general sales manager of Buick. He succeeds O. L. Waller who resigned because of ill health and who will retire to Chicago after 36 years with Buick. Mr. Belfie joined Buick in 1933 after several years' experience with Oldsmobile and the Buick-Oldsmobile-Pontiac organization. Since January he had been in charge of the Eastern area for Buick.

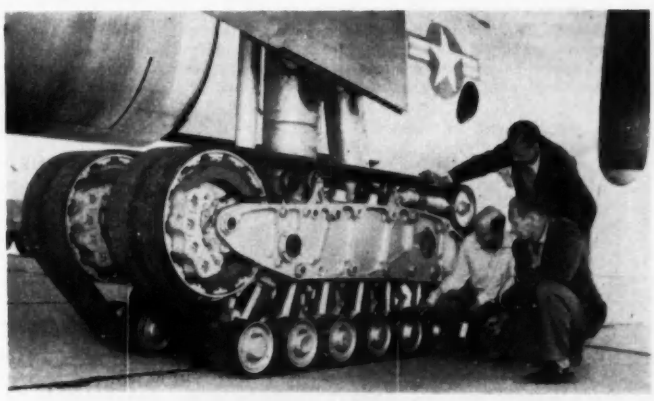
Automobile Insurance Rates to Come Down

Reports indicate that automobile liability insurance rates are slated for reductions in all section of the country over the next year and a half. It is believed that the reductions in premiums will average from 15 to 18 per cent on liability and property damage insurance rates. The cut in premiums has already started in several states. One factor responsible is the growing percentage of new cars on the road and the junking of older and unsafe vehicles.

Rinshed-Mason Promotes Thieben in Purchasing

H. Dale Thieben has been promoted to director of purchases by Rinshed-Mason Co. He joined the firm 17 years ago as an analytical chemist.





EXPERIMENTAL CATERPILLAR

The USAF's B-36 is shown (top) undergoing experimental tests with caterpillar-type track landing gear (bottom) at Fort Worth, Tex. The rubber belt tracks, the single disk brakes (left) and the brake bogies were all made by the Goodyear Tire & Rubber Co. Each belt is 16 in. wide, 275 in. in circumference, and has a thickness of one inch except for an additional one-inch "V" in the center which fits into the bogie wheel slot. The belting is reinforced with brass-plated steel cable.

News of the AUTOMOTIVE INDUSTRIES

Ford to Build Parts Depot at Cleveland

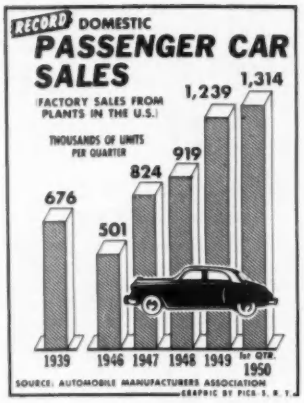
Ford will build a new parts depot at Cleveland on a 12-acre industrial site recently acquired. It will be a one-story building with 160,000 sq ft of warehouse and office floor space. In addition to servicing Ford dealers in sections of Ohio, Indiana, Illinois and Pennsylvania, it will house the local Ford and Lincoln-Mercury district sales offices. Construction will start soon.

Chrysler's Los Angeles Plant Operating at Capacity

Chrysler Corp.'s Los Angeles plant has stepped up production to the highest point in its history, according to company officials. The plant is now producing Dodges, Plymouths, De Sotos and Chryslers at the rate of 450 cars a day, and is the only Chrysler plant turning out four different cars on one assembly line.

Chicago Dodge-Chrysler War Plant to be Federal Center

Failing to sell the wartime Dodge-Chrysler plant in Chicago, once leased to the Tucker Corp., the government has announced plans to convert it to a Federal Center. About a third of the space will be used to store machine tools and production equipment of the industrial reserve along with government records. The remainder will probably be converted to office space for agencies now housed in commercial buildings, beginning next January.



Automotive Demand Boosts Gray Iron Foundry Shipments

Sustained demand by the automotive industries has pulled gray iron foundry employment upward since January and will have a stabilizing influence on the industry for the remainder of 1950. Foundry shipments for the year are now forecast at five per cent over 1949. Gray iron production required 127,000 workers in March, an increase for the year but nine per cent below a year ago, the Bureau of Labor Statistics says.

Continental Motors Net Shows Sharp Increase

Continental Motors has reported earnings of $912,658 for the quarter ended April 30 of this year, nearly 100 per cent greater than the preceding three months. During the corresponding quarter of last year, Continental earned $698,717. For the six months ending April 30, however, earnings were $1,374,351, compared with $1,319,414 for the same period a year ago.

So. Calif. Aircraft Industry Largest Employer in Area

Southern California's aircraft and parts industry now employs 97,000 workers—the largest employer of manpower in the area. Los Angeles County alone accounts for 70,000 of the total figure.

Trico Products May Expand Buffalo Operations

The Trico Products Corp. has announced that it contemplates "extension of manufacturing facilities in its South Buffalo plant operations." The company also reported 1949 net income of $3,407,783, equal to $5.04 a share. In 1948, net income was $3,168,195, or $4.69 a share. The annual report said that an all-time peak in employment in the company's five plants in Buffalo, N. Y., was recorded during 1949. The report also said that the company's investment in plant, buildings, machinery, and equipment in the four years since Jan. 1, 1946, totaled $8.4 million.

Jamestown Metal Buys Plant for Automotive Division

The Duramold Plant, Jamestown, N. Y., constructed during the war at a cost of $1.5 million, has been purchased by the Jamestown Metal Corp., and will house the automotive division of the company. The current plant of the automotive division will be abandoned. The new plant has 145,000 sq ft of floor space.

Highway Safety Group Names Three New Members

The appointment of three additional members to serve on the National Inter-Industry Highway Safety Committee has been announced by James J. Newman, chairman, and vice president of the B. F. Goodrich Co. The new members are: J. R. Davis, vice president, sales and advertising, the Ford Motor Co.; R. D. McKay, first vice president, National Automobile Dealers Association; and R. S. Wilson, vice president, the Goodyear Tire and Rubber Co., Inc.

FIVE IN ONE

New standard equipment on all new Ford tractors, the Proof-Meter (see page 22, June 15th AUTOMOTIVE INDUSTRIES) enlarged in the lower right hand corner, shows engine speed, tractor speed, power take-off speed, belt pulley speed and total hours worked by the tractor. Dearborn Motors Corp. officials, who made the announcement, say that it is the first instrument of its kind to be made available on a farm tractor.

Men in the News

Current Personnel Appointments and Changes at Plants of Automotive Manufacturers and Their Suppliers.

General Motors Corp.—The election of **Mason M. Roberts**, as General Manager of the Frigidaire Div., has been announced.

Buick Motor Div., General Motors Corp.—The appointment of **A. R. Belfie** as General Sales Manager, has been announced.

Hudson Motor Car Co.—**W. H. Thoreson** has been appointed Director of Overseas Operations.

Nash Motors Div., Nash-Kelvinator Corp.—**Loren H. Hunt** has been appointed National Business Management Manager.

The Electric Auto-Lite Co.—The appointment of **Donald B. Seem** as Advertising Manager, has been announced.

Spicer Mfg. Div., Dana Corp.—**Walter I. Buchanan** has been appointed to the position of Sales Manager of the Service Parts Div.

Doehler-Jarvis Corp.—The announcement of the appointment of **Charles F. Stein** as General Purchasing Agent, has been made.

General Electric Co.—**Paul F. Preston** has been appointed manufacturing manager of the company's Chemical Dept.

Acheson Colloids Corp.—**Melvin L. Bunting** has been appointed Technical Service Engineer for the company. His functions will include engineering assistance to customers and new applications research.

Link Aviation, Inc.—The appointment of **David Mason** as Vice-President and Controller, has been announced.

United States Steel Corp.—**Max D. Howell**, Asst. to the President, Vice-President, Secretary and Treasurer, has been elected Vice-President and Treasurer of the Corporation. **Samuel B. Kingham** and **Howard E. Isham** have been made Asst. Comptrollers.

American Steel & Wire Co.—**Perry T. Coons** has been appointed Asst. to the Vice-President in charge of Sales.

American Steel & Wire Co.—The appointment of **Dr. Arthur M. Edwards** to the newly created post of medical director, has been announced.

Aluminum Co. of America—**M. E. Brooks** has been appointed Chief Mechanical Engineer, succeeding **B. C. McFadden**, who has retired.

Jos. T. Ryerson & Son, Inc.—**V. H. Dieterich**, Vice-President and Director, has retired after serving 45 years with the company.

United States Rubber Co.—**Dr. Arthur E. Brooks** has been appointed manager of the company's general Laboratories at Passaic, N. J.

The Cleveland Industrial Tool Corp—The appointment of **R. S. Koroncai** as Sales Manager, succeeding **Hunter N. Williams**, has been announced. Mr. Williams has been made Vice-President in charge of Sales.

The General Tire & Rubber Co.—**Thomas F. O'Neil**, of Boston, has been named a Vice-President of the company.

The Baker-Raulang Co., Industrial Truck Div.—The election of **H. Dudley Swim**, as Chairman of the Board; **Clarence M. Taylor**, as Chairman of the Executive Committee and **John R. Merrill** as Vice-President in charge of Sales, has been announced.

American Management Assoc.—**Wilbur H. Norton**, Vice-President, General Motors Corp., has been elected a director of the association.

Fruehauf Trailer Co.—The appointment of **Fred E. Burnham** as controller, has been announced.

A. Schrader's Son Div., Scoville Mfg. Co.—**Selden T. Williams** has been named President of the division.

Dearborn Motors Corp.—**Thomas A. Farrell** has been named President. He succeeds **Frank R. Pierce**, deceased. **Merritt D. Hill** is a newly elected Vice-President and member of the board of directors.

(*Turn to page 74, please*)

CALENDAR

OF COMING SHOWS AND MEETINGS

Conventions and Meetings

Inst. of the Aeronautical Sciences Annual Summer Meeting, Los Angeles ..... July 12-14
International Trade Fair, Chicago Aug. 7-19
SAE Nat'l West Coast Mtg., Los Angeles ..... Aug. 14-16
American Chemical Society, Chicago Sept. 3-8
SAE Tractor Mtg., Milwaukee.....Sept. 11
Nat'l Assoc. Motor Bus Operators Annual Mtg., Chicago .....Sept. 13-15
Instrument Soc. of Amer. Conf. & Exhibit, Buffalo .....Sept. 18-22
British Truck Show, London... Sept. 22-30
Nat'l Metal Trades Assoc., New York City .....Sept. 27-29
Paris Automotive Show, Paris .. Oct. 5-15
SAE Nat'l Transportation Mtg., New York City .....Oct. 16-18
Nat'l Safety Congress, Chicago.. Oct. 16-20
Society of the Plastics Industry Nat'l Conference, Swampscott, Mass. Oct. 18-20
British Passenger Car Show, London, Oct. 18-28
Amer. Society for Metals' Annual Nat'l Metal Congress & Exhibition, Chicago ..... Oct. 23-27
Amer. Welding Soc. Annual Mtg., Chicago .....Oct. 23-27
Nat'l Lub. Grease Inst., Chicago, Oct. 30-Nov. 1
Amer. Soc. Body Engrs. Technical Convention, Detroit ..... Nov. 1-3
American Petroleum Institute Annual Mtg., Los Angeles ..... Nov. 13-16
Power & Mech. Engineering Exposition, New York City .. Nov. 27-Dec. 2
Soc. of Plastic Engrs., New York City Jan. 18-20
Amer. Soc. Tool Engrs., New York City ..... Mar. 17
Pacific Automotive Show, Seattle Mar. 21-24

Necrology

Elmer Bisbee, 67, construction engineer for many overhead assembly systems in heavy bomber plants, died in Los Angeles. He retired five years ago after serving as construction engineer, Consolidated Steel Corp. and as co-owner of Industrial Construction Co.

H. O. K. Meister, 62, general manager, G.M's Hyatt Bearings Div., died on June 10 at Shelter Island, N. Y.

Martin J. Brennan, 56, senior manufacturers' sales representative Willard Storage Battery Co., died in Detroit on May 30.

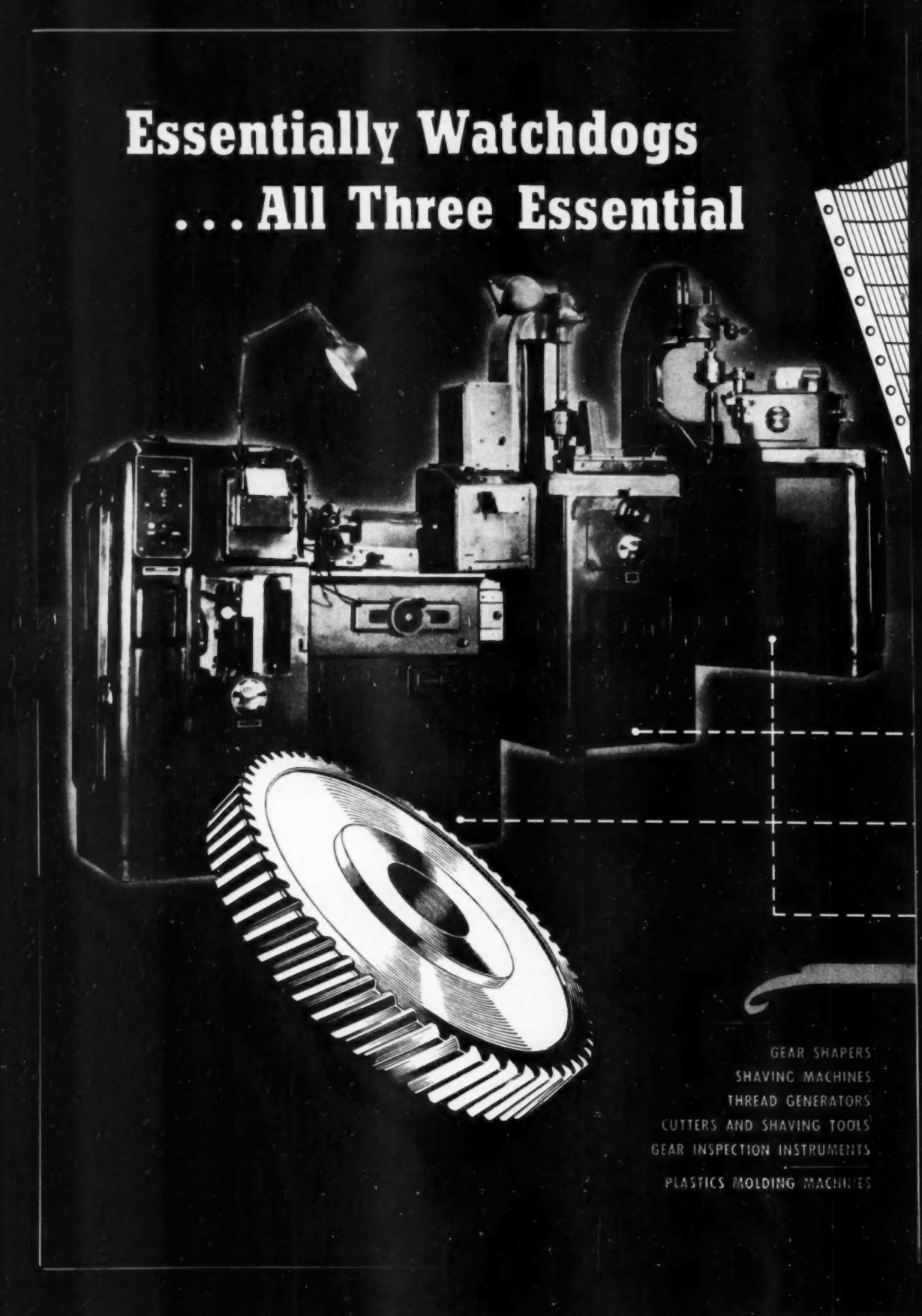
Eugene B. Powell, 53, regional manager of GM's AC Spark Plug Div. on the west coast, died in Phoenix, Ariz., June 8.

Orville Davies, 55, retired vice-president, Motors Insurance Corp., a GM subsidiary, died on June 11, in New York City.

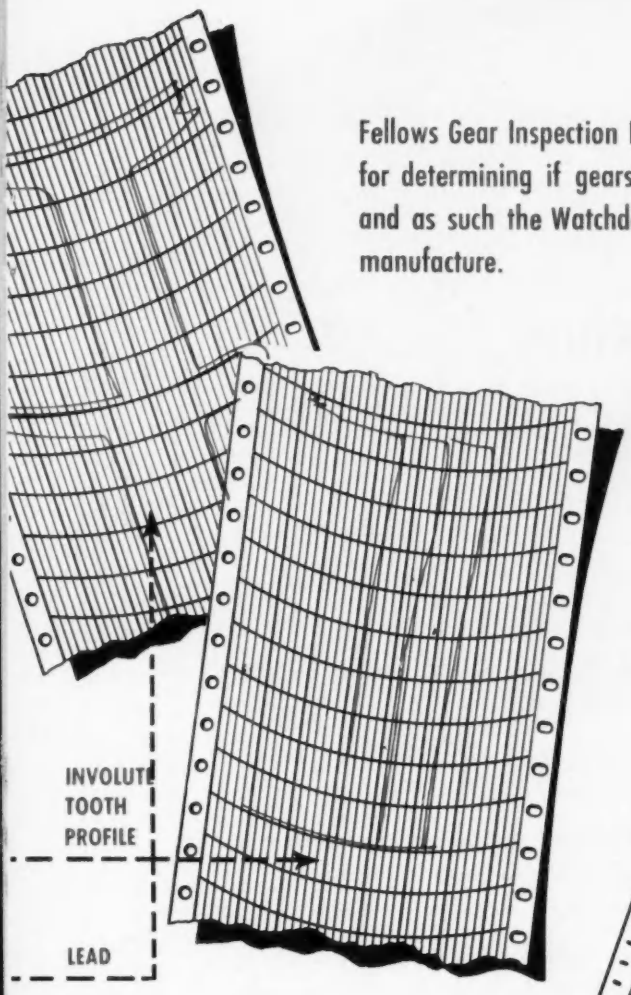
Winthrop W. Benner, 69, former executive vice-president, Lee Tire and Rubber Co., died on June 11 in Arcola, Pa.

Almon L. Beall, 60, assistant chief engineer, Wright Aeronautical Corp., died on June 17 at Packanack Lake, N. J.

Essentially Watchdogs ... All Three Essential



GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS
PLASTICS MOLDING MACHINES



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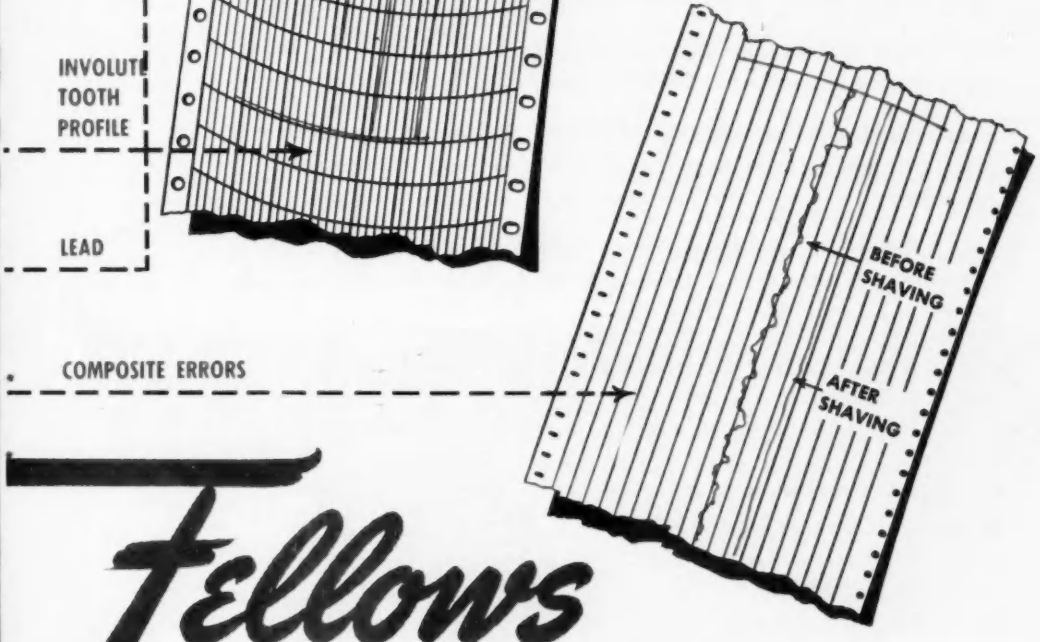
A full complement of Inspection Instruments pays for itself many times over in the losses it prevents. Each of these three instruments has a job to do, and all are essential... ALL produce charted records, incontestible, for analytical study and for permanent filing. You can verify the accuracy of work with errors magnified 200 to 500 times on the Fellows Inspection Instruments Charts.... Literature on each of these Instruments is available, as is also the consulting advice of a Fellows Sales Engineer regularly in your vicinity. Write "Fellows" at the nearest office.



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Why should Exide quarrel with Mr. Diesel?

Exide shouldn't . . . didn't . . . even though Mr. Diesel's engine presented a cranking problem that was plenty tough.

The whole success of Mr. Diesel's invention depends on its terrific compression.

So the very thing that makes Mr. Diesel's engine possible, puts an unusually heavy load on a starting battery.

Exide couldn't change this, but it could design a starting battery to meet the requirements. So that's what Exide did.

Even if Mr. Diesel had purposely tried to "stump" batteries, you are never going to know it, judging from the quick breakaway and high cranking speed furnished by Exides.

Let Mr. Diesel, the weatherman or the engine's temperament try stumping an Exide Diesel Battery. It can't be done. Exide has built this battery to make Diesel starting easy. This battery does it.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32
Exide Batteries of Canada, Limited, Toronto

THE LARGEST BATTERY RESEARCH STAFF is responsible for developing, improving and testing Exide Batteries. Exides for Diesel cranking are forced to live through factory tests that are much tougher than actual service.

1888 . . . DEPENDABLE BATTERIES FOR 62 YEARS . . . 1950

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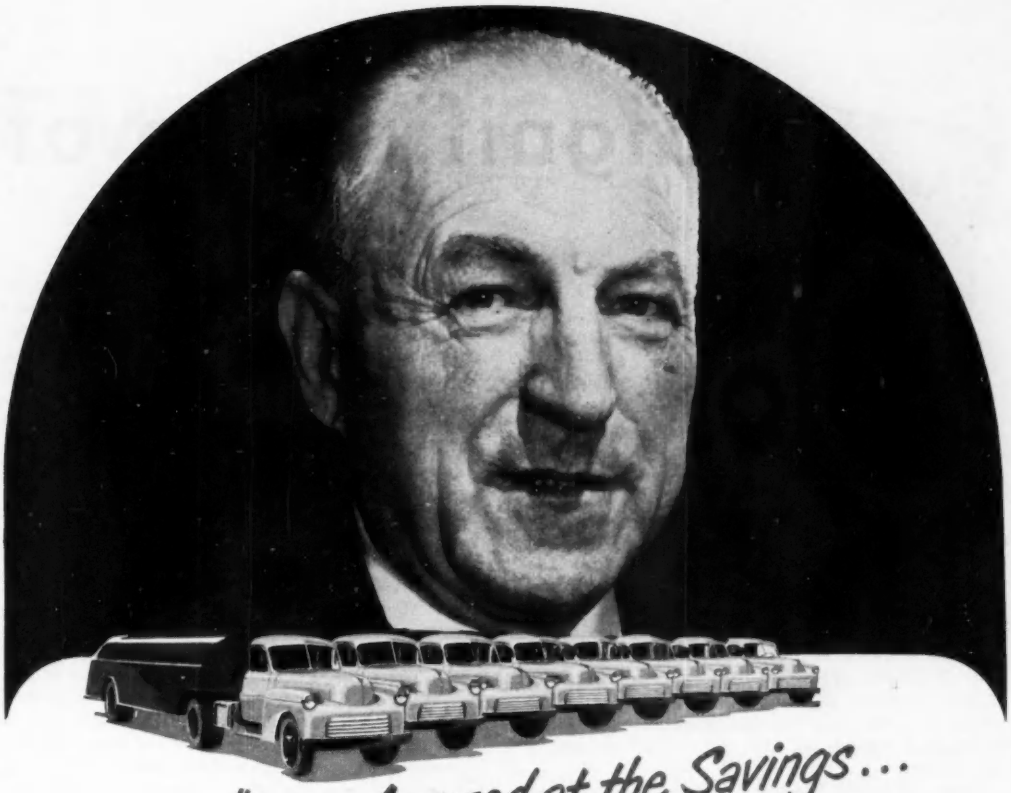

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AFTER WE ADDED BENDIX-WESTINGHOUSE AIR BRAKES!"

Whether they carry food, fuel oil or furniture, trucks with Bendix-Westinghouse Air Brakes regularly roll up amazing records of savings. And, cutting maintenance costs is only half the story. With the extra service life in Bendix-Westinghouse Air Brakes your trucks stay on the job—earning money hauling valuable pay loads instead of piling on expenses in the shop. Add the extra safety, the faster trip speeds and schedules and you'll see why truck-operating business men get so enthusiastic. On new trucks or old—for maximum performance and profits—specify Bendix-Westinghouse Air Brakes.

THE BEST BRAKE IS AIR

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ELYRIA, OHIO

Significance of

By Leonard Westrate

ANALYSIS of the five-year agreement between General Motors and the UAW-CIO reveals two significant facts. One is the obvious confidence of General Motors that business conditions over the next five years are going to remain at a high level and thus warrant an annual wage increase of four cents an hour with a limit of 3 cents an hour decline no matter how low the cost of living index may go. The other is definite contractual recognition by the union of the importance of technological process including better tools, methods, processes and equipment and a cooperative attitude on the part of all parties in such progress.

Some interesting speculation arises in connection with the unique escalator clause in the new contract. The union had previously contended that the cost of living provision would be abandoned, but with its adoption again for the next five years, it may well become a fixture not only in GM contracts, but in others as well, if tied in with an annual improvement factor. Such a development would certainly go a long way toward eliminating the bitter wrangles over wages that have plagued the industry for so many years. There might have to be some modifications, of course, particularly in the amount of the improvement factor at companies which may not be so efficient as GM, and the minimum level at which a drop in the cost of living would not be followed by a decline in wage rates.

The annual improvement factor—gearing of wages to cost of living—pensions, fixed contributions into a retirement fund regardless of changes in Federal Social Security, life insurance, and sickness and accident benefits all had been granted in the previous contract by GM or by other companies in the industry before General Motors signed its current agreement.

It is the first time, however, that any company has been able to work out an agreement covering not only pensions and insurance, but also wages and all economic and contract issues for as long a period as five years. Such a move is certain to have far reaching effects not only on General Motors but on the entire industry and perhaps in other industries. The trend over the past two or three years has been for longer contracts and the new General Motors agreement will go a long way toward stabilizing the labor situation for long intervals.

Social Security benefits are not deducted from the basic pension formula under the new contract between GM and the UAW-CIO. Even if Social Security benefits are increased, retired employes will receive $1.50 a month times years of service, up to a maximum of $45 per month. In the case of employes 65 years of age having 25 years' service, $100 per month is provided but the Social Security benefit is deducted. An employe who retires with company consent between the ages of 60 and 65 will receive a pension equal to $3.00 per month times years of service up to a maximum of $90 per month until he is 65 years of age. Employes who retire early without company consent will have their benefits reduced by 7.2 per cent from the normal pension for each year under age 65. All hourly employes of GM in the U. S. with 10 years service at retirement are covered by the plan

There has long been evidence that labor unions have not been sympathetic to introduction of new processes and equipment which may tend to turn out much more production with the same number or fewer workers. GM has scored a significant point by writing into its contract the recognition by both parties that such methods and equipment are essential for greater efficiency, lower costs, and higher wages and that "to produce more with the same amount of human effort is a sound economic and social objective."

Effects of the GM settlement on other companies in the industry still is uncertain. It is believed, however, that one result will be drives for higher wages at Ford when the contract is open on that question next Jan. 1, and at Chrysler on May 1 of next year. Meanwhile, a more immediate question is how smaller industries and parts suppliers who have not yet concluded pension agreements with the union will fare. Obviously, many smaller companies simply cannot afford the kind of package that GM gave its employes. A company like Packard, for example, with an average age level of employes in the early 50's would face

GM-UAW Contract

a staggering cost for funding past service credits. Some observers believe that in such cases most of the package would have to go for pensions, with insurance and other benefits sidetracked for the time being. Most smaller companies have been holding contract talks in abeyance waiting for the Big Three to settle. However, ability to pay certainly is going to come into the picture again but in reverse order from what it was when the union was pushing that point of view in the GM strike of 1946. Of the independents, Nash is the only company so far to conclude a pension agreement, although Kaiser-Frazer has a tentative agreement to pay pensions on a basis very similar to the Ford plan. Details are being worked out with the union.

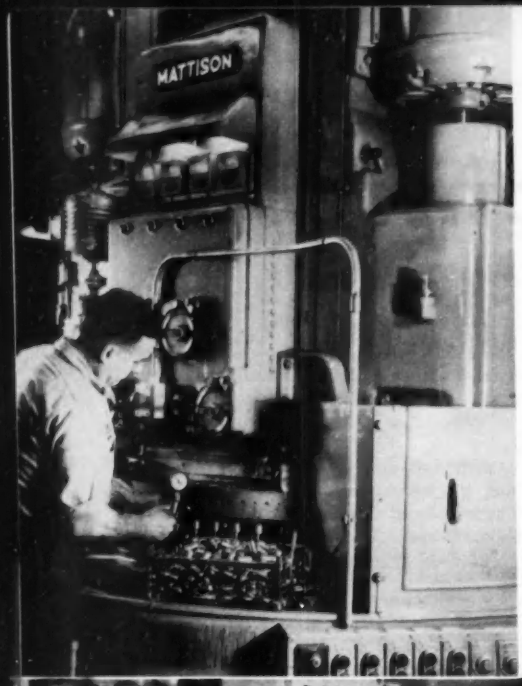
There is some talk that the area-wide pension program which the union failed to get in the Toledo area may be introduced as a possibility for the smaller automobile companies. Under that arrangement, the

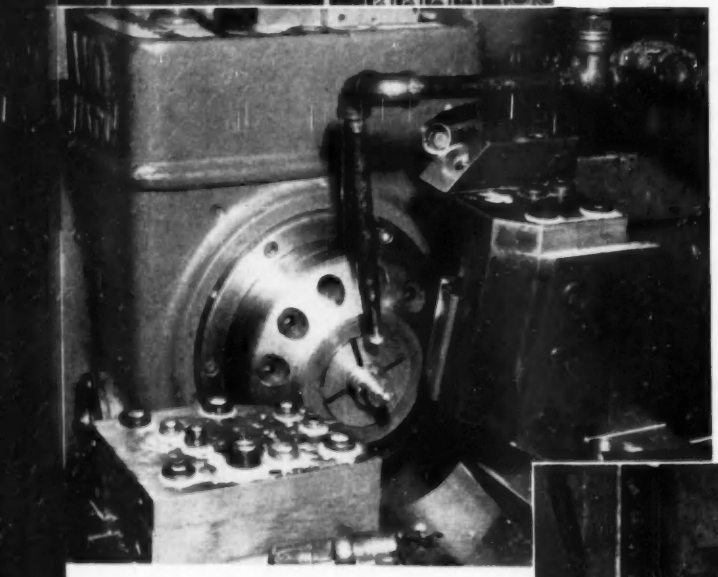
(*Turn to page* 76, *please*)

Comparison of Principal Features of Company-Paid Pension Plans at General Motors, Ford, Chrysler and Nash

	Ford	Nash	Chrysler	General Motors
Date of agreement	March 1, 1950	March 15, 1950	May 4, 1950	May 23, 1950
Retirement benefit at normal retirement age including Federal Social Security (mo.)	$100	$100	$100	$100
Pension increase if Federal Social Security raised	No	Subject to discussion	No	Yes
Company's share decreased if Federal Social Security raised	Yes	No	Yes	No
Duration of agreement	5 years	5 years	5 years	5 years
Normal retirement age and years of service required for full pension	65 – 30	65 – 25	65 – 25	65 – 25
Automatic retirement age	65	68	68	68
Work beyond retirement age	To 68 at company's option	Subject to negotiation	With company consent	With company consent
Early retirement provision at proportionately lower benefit	Yes	Yes	Yes	Yes
Disability pension provided	Yes	Yes	Yes	Yes
Vesting	No	No (but study committee to report by end of 1950)	No	No
Earliest date of compulsory retirement	Jan. 1, 1951	July 1, 1951	Jan. 1, 1952	Jan. 1, 1952
Accrue service credits after 65	No	Up to age 68	Up to age 68	Up to age 68
Union share in control of fund	No	No	No	No
Company-union joint committee on pension eligibility	Yes	Yes	Yes	Yes

Manufacturing Ford's





DURING the past few years Ford Motor Co., of Canada has made impressive manufacturing advances and economies through the introduction of new machinery. A major example of this is the extensive transfer machine line for V-8 cylinder blocks which has been in operation several years. The process of modernization in the interest of cost economy is continuing at an accelerated pace.

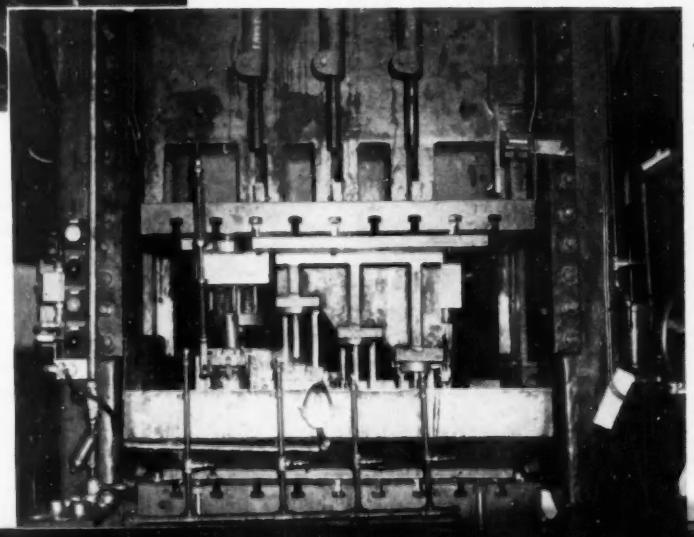
The present study is concerned with a sampling of some outstanding operations of recent origin which should be of real interest to readers of AUTOMOTIVE INDUSTRIES.

One of the noteworthy installations—the first in this plant—is the Fellows planetary gear shaper. As shown in the illustration it is a six-station machine tooled for cutting 16 helical teeth on the transmission main drive gear. The unusual appeal of this machine arises from its ability to handle a large volume of work in a unit occupying relatively small floor space and tended by a single operator. Productivity is rated at around 72 to 75 pieces per hour.

The foot of Ford valve tappets is given a ground finish of 6 to 8 micro-inches (rms) while length is held to plus or minus 0.0005 in. in this four-head Mattison surface grinder.

Close-up of tooling on the Sundstrand automatic lathe for producing brake anchor pins. The back slide carries the solid-carbide forming tool while the front slide has solid carbide single-point tools for rough turning.

Intimate view of the bed and die equipment for drawing tappet bodies from a steel disk. This is a Canadian-built Minster press fitted with a three-station die and four punches. The entire operation is automatic.



Advances At

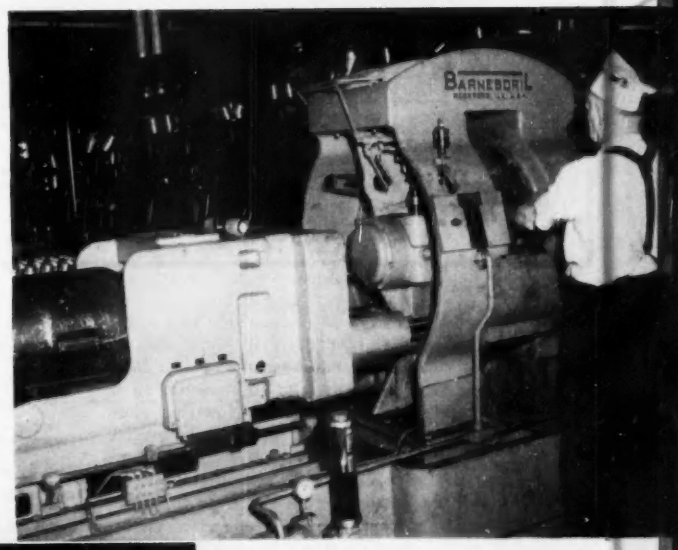
Canadian Plant

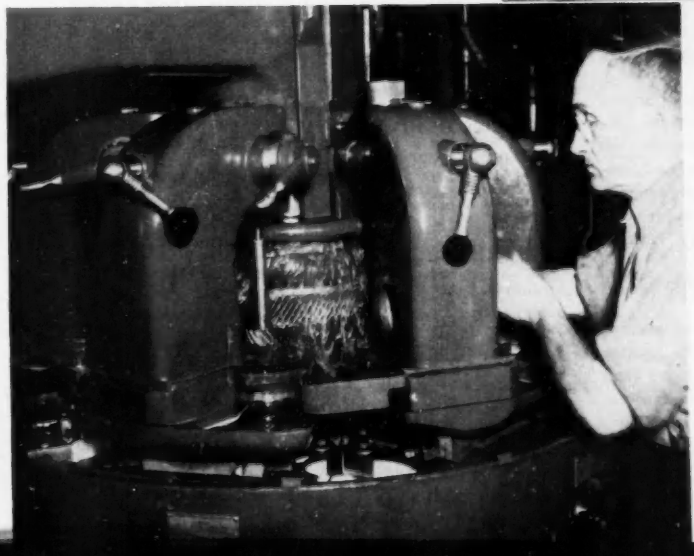
By Joseph Geschelin

Several additional units will be installed soon.

Another highly productive machine of outstanding merit is the Sundstrand automatic lathe tooled for producing the rather intricately-formed brake anchor pin from cold headed upset stock in one setting at the rate of 180 per hour. Secret of this operation is the development of a solid carbide forming tool shown in the tool layout reproduced here. Turning is done by means of solid triangular carbide tools in the vertical holder in front, followed by feeding-in of the forming tool.

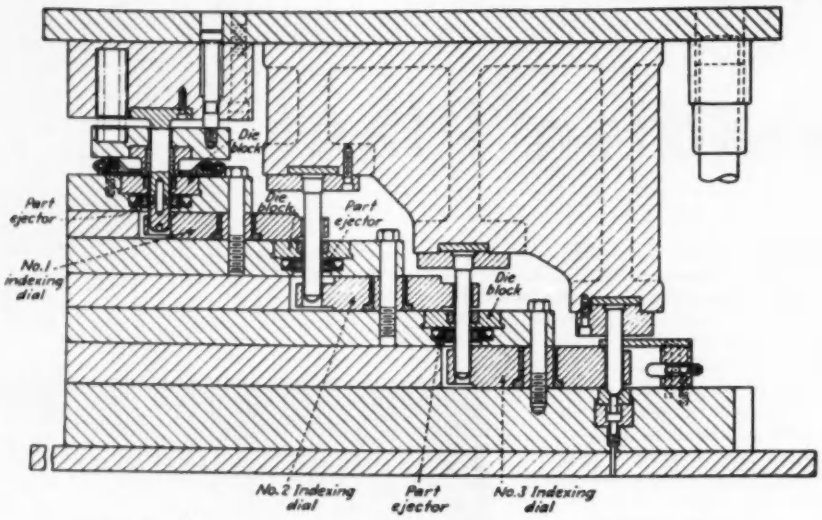
Fabrication of the hollow valve tappets has been greatly simplified, as compared with former practice, by the introduction of a new 200-ton Minster press. Ford continues the former practice of drawing a relatively deep shell from a thin steel disk. However, instead of making repeated draws in separate presses, the entire operation is done in the three-stage die of the Minster press. As shown, the press bed is fitted with a three-stage die having three separate dial feed tables. The first draw is handled in the station at the left, the work being progressively ejected and fed automatically into each of the other two stations.





The two-way Barnesdril machine shown here is an excellent example of single purpose equipment being installed in the Ford plant. Designed to finish both ends of oil pump bodies, the machine has a trunnion fixture of 17-station type and has a productivity of 90 pieces an hour.

This is a close-up of the work station of the new Fellows six-station planetary gear shaper. One of the 16-tooth transmission drive gears is shown in the foreground.



Vertical section through the draw die arrangement on the Minster press for producing tappet bodies. It shows the detail of the four punches, the draw dies, and the three indexing dials that shift cups from station to station.

Another simplification, conducive to lower cost, is the elimination of the copper-plating of the steel disk. This was done originally, and up to recently, as a means of improving drawing quality. Now they simply coat the disk with a suitable drawing compound and get a perfectly acceptable job.

In making the Ford tappet, the cylinder is closed by means of a machined plug welded over the open end. The latest development in this connection is the adoption of the four-head Mattison grinder for surface grinding this plug to exact length within plus or minus 0.0005 in., and with a surface finish of 6 to 8 microinches (rms).

As an example of the character of single-purpose machines being spotted on various operations, we selected the special Barnesdril unit for machining oil pump bodies, illustrated here. As shown, it is of two-way type so as to machine both ends simultaneously, and fitted with a 17-station trunnion type fixture. It has an exceedingly high rate of productivity, capable of finishing 90 pieces an hour.

The sequence of operations in this machine is as follows:

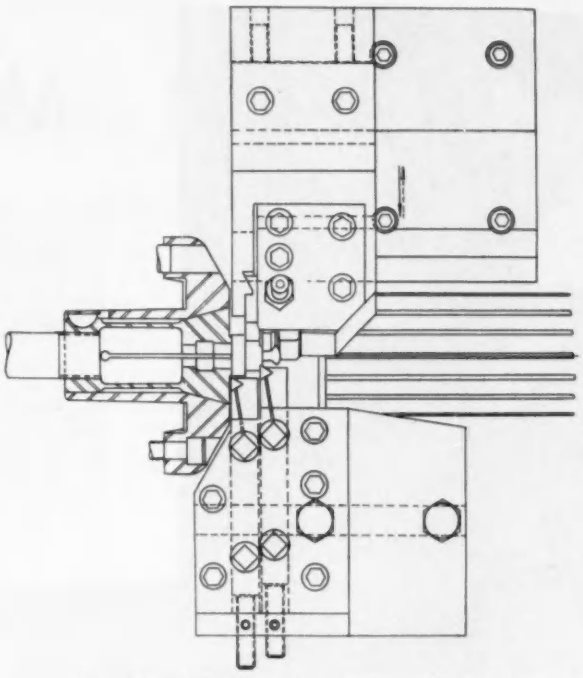
Owing to relatively lower daily output and greater diversification of models, the company pays greater attention to equipment flexibility. It is of more than passing interest, for example, to find that the cylinder

Station	Head	Operation
1	...	Load and unload.
2	LH	Idle.
	RH	Core drill shaft hole to $^{19}/_{32}$ in. dia.
3	LH	Core drill and chamfer other end of shaft hole.
	RH	Drill the idler stud hole $^{27}/_{64}$ in. dia.
4	LH	Rough ream shaft hole (stem end).
	RH	Rough face gear end face and rough hollow mill $2^1/_2$ in. dia.
5	LH	Rough face small end and chamfer shaft hole.
	RH	Rough bore driver gear pocket to 1.172 in. dia.
6	LH	Semi-finish face small end.
	RH	Semi-finish large end face and finish 2.500 in. dia.
7	LH	Drill lug hole $^3/_8$ in. dia.
	RH	Rough bore idler gear pocket and chamfer stud hole.
8	LH	Idle.
	RH	Semi-finish bore driver gear pocket.
9	LH	Idle.
	RH	Semi-finish bore idler gear pocket.
10	LH	Idle
	RH	Drill one relief valve circulating hole.
11	LH	Idle.
	RH	Drill other relief valve circulating hole.
12	LH	Idle.
	RH	Chamfer one relief valve circulating hole.
13	LH	Idle.
	RH	Rough ream shaft hole (gear end).
14	LH	Idle.
	RH	Rough ream idler stud hole.
15	LH	Idle.
	RH	Drill (4) $^{13}/_{64}$ in. holes.
16	LH	Idle.
	RH	Chamfer (4) $^{13}/_{64}$ in. holes.
17	LH	Idle.
	RH	Ream (4) $^7/_{32}$ in. holes.

Canadian Plant

block transfer line has been so tooled as to permit the processing of two different blocks over the same line. Although both blocks are substantially the same, they differ in that one has a separable flywheel housing while the other has an integral flywheel housing. In changing over to machine the latter, two of the units in the transfer line—a Footburt and an Ingersoll—are provided with a locked switch which is changed by the tool setter. A simple flip of the switch idles certain heads and cuts in certain others.

Although the press shop handles only small stampings, the new equipment program contemplates the installation of larger presses than heretofore so as to afford greater capacity when needed. To this end, they have installed a group of three Canadian-made Minster presses, 48 by 72 in., rated 200-ton capacity. A new 750-ton Clearing press also was installed recently.



Tool layout for the Sundstrand automatic lathe. The forming tool is shown at the rear while the solid triangular carbide bits for turning are mounted on the front slide.

BOOKS . . .

STRESS AND STRENGTH OF MANUFACTURED PARTS, by *Lipson, Noll,* and *Clock,* published by *McGraw-Hill,* New York, N. Y. The authors analyze the problem of product design in terms of significant stress, combination of service loading, assembly, and fabrication loading, and significant strength, the allowable stress. They also discuss in some detail the economic balance between stress and strength, emphasizing the need for more reliable and realistic balance than that afforded by the commonly used factor of safety. A total of 175 charts provide unique design data of practical value. The book should prove of great interest to students, engineers and designers.

THE MOTOR YEARBOOK 1950, by *Laurence Pomeroy* and *R. L. de Burgh Walkerley,* published by *Temple Press Ltd.,* Bowling Green Lane, London, E.C.1, England. Price $1.75. This book covers, primarily, British technical developments, cars of the year, racing results, and performance figures of passenger cars for the year of 1949. Only one chapter is repeated from the 1949 edition and that is to give the reader some background information on how the standards of performance are used. Besides covering British racing results, the literature also gives results of races held in varied portions of the world and covers the principal racing circuits of Europe. Ample illustrations accompany the text.

SYMPOSIUM ON TESTING OF CAST IRON WITH SR-4 TYPE OF GAGE, published by *American Society for Testing Materials,* 1916 Race Street, Philadelphia 3, Pa. Price $1.65. Papers and discussions in this symposium cover such items as analysis of locked-in stresses in automotive cylinder blocks, strain testing of crankshafts, engine frames and cylinders, and tests on Diesel cylinder block heads and pistons.

MANUAL ON FATIGUE TESTING, published by *American Society for Testing Materials,* 1916 Race Street, Philadelphia 3, Pa. Price $2.50. The manual contains eight sections dealing with such items as symbols and nomenclature for fatigue testing, testing machines, and specimens and their preparation. Purpose of the booklet is to supply information to those setting up new laboratory facilities, to aid in operating equipment properly, and to offer advice on presentation and interpretation of data.

THE FATIGUE ALLOWANCE IN INDUSTRIAL TIME STUDY, by *Matthew A. Payne,* published by *Matthew A. Payne,* 13777 Euclid Ave., E. Cleveland 12, Ohio. Price $2.50. An analysis of an important labor-relations problem, that of a fair day's work, is dealt with in this booklet. Problems associated with the purpose, determination, and application of fatigue allowance in industrial time study are discussed as well as industrial engineering opinions concerning its effect upon workloads, fair day's work, manpower and incentive assignments.

WELDING HANDBOOK, *Third Edition,* published by *American Welding Society,* 33 West 39 St., New York 18, N. Y. Price $12.00. More than 50 welding and cutting processes in use by industry today as well as the welding of ferrous and non-ferrous metals and alloys, and the application of welding in different industries, are covered in the book's 65 chapters. The text also contains material on cost estimating, welding metallurgy, physics of welding, a dictionary of welding terms, general engineering tables, welding symbols, and filler metal specifications. Ample illustrations and over 300 tables are included for ready reference and to elaborate on the text.

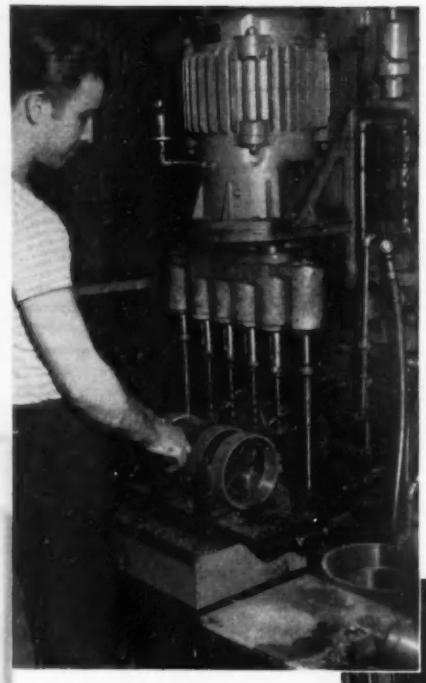
INDUSTRIAL INSPECTION METHODS, *Revised Edition,* by *Leno C. Michelon,* published by *Harper & Brothers,* 49 East 33 St., New York 16, N. Y. Price $6.00. Basic concepts, dimensional control, testing for physical and mechanical properties, surface inspection, and inspection organization and personnel are the major divisions of this book. Tools used for inspection work are fully described and their use illustrated. Extended treatment is given to statistical quality control methods, modern destructive and non-destructive tests for physical and mechanical properties, modern techniques in surface measurements, and other similar topics. Over 450 illustrations as well as tables and charts accompany the text.

A.S.T.M. SPECIFICATIONS FOR STEEL PIPING MATERIALS, prepared by *Committee A-1 on Steel,* published by *American Society for Testing Materials,* 1916 Race St., Philadelphia 3, Pa. Price $3.00. Including some 50 widely used specifications, this is the latest compilation of ASTM Standards on steel piping materials. All types of steel pipe are covered as well as materials used in pipe and related installations. Grain Size Standard E 19, American Standards on steel and iron pipe (B 36.10), and the latest stainless steel document (B 36.19) are included in the publication.

(*Turn to page 78, please*)

Making *Low and*

Special Techniques Employed at the Moraine Products Division of GMC in Making Important Parts for the Chevrolet Automatic Transmission are Described in this Article, Fourth in a Series Devoted to Production of the Powerglide Transmission.



Following broaching, the pressure lugs on the bands are drilled for the spring and rivet assembly.

Bonding of the formed friction strip to the band casting is done in these fixtures. The parts at the side of the fixtures show the method of holding the friction strip in place by means of a flexible steel liner.

CHEVROLET'S Powerglide transmission employs a molded, semi-metallic friction material as facing on the four driving plates of the nine-disk wet clutch and for linings in the malleable iron low and reverse bands. Because of the high surface heats and severe engagements sometimes encountered in this type of service, it was necessary for the Moraine Products Division of GMC, maker of the bands and clutch disks, to develop a special compound to meet the requirements. This compound consists of an asbestos base, fillers, and suitable friction modifiers, plus a percentage of various metallic constituents. A phenolic binder, expressly selected to obtain certain properties, is used to bind this composition together. The ingredients are mixed thoroughly to obtain uniform distribution. As it comes from the mixer, the material has a wet, putty-like consistency and is the same for both bands and clutch plates, but from this point, the processing differs.

Low and reverse band assemblies are alike and each consists of a malleable casting, a friction material strip, and a spring and rivet assembly. The friction material used is cut to length and scored to make three equal width strips. After scoring, the strips are partially cured.

To facilitate processing, the malleable iron casting is initially a complete cylinder. It is first ground to the proper width, then the inside diameter is bored

Reverse Bands for the Powerglide

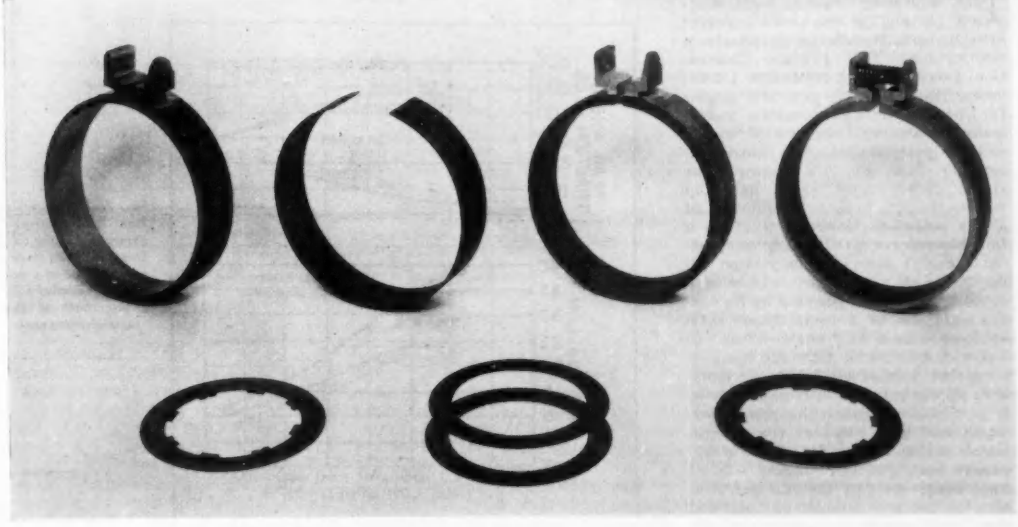
and before going to the next machine the casting is passed through an alkaline degreasing bath. The pressure lugs are next broached to receive the pressure application struts, and again the casting is put through a degreasing bath. The pressure lugs are now drilled in a multiple drill press to accommodate a spring and rivet assembly. The drilled holes are then burred, and the casting is subjected to a nitric acid etch to clean the inner surface preparatory to applying the bonding cement. The cement used is an elastomer filled phenolic and is applied in a uniform layer on the etched surface of the casting which is then ready for the assembly of the friction strip.

After the friction material is partially cured and cooled, it is heated to relieve the brittleness and to allow for the forming to the inside of the casting. The formed friction strip is placed inside the cement coated casting and a flexible steel liner used to distribute the pressure evenly over the material during the bonding process. The cemented

(*Turn to page 70, please*)

Final operation is the addition of the spring and rivet assembly and slotting to allow for compression of the band. This is followed by another furnace cycle to complete the lining cure.

Shown below are the low and reverse bands as well as clutch plates for the Chevrolet Powerglide transmission.



Round Table Discussions Among

Highlights of SAE

THE current upsurge of automotive activities with automobile production at an all-time high was reflected last month at the summer meeting of the Society of Automotive Engineers in the overflow crowd of engineers and technicians on hand for the six-day program. The attendance of 1400 members and guests surpassed last year's figure by a big margin.

Among the main features were 12 round-table technical sessions which were devoted to timely engineering problems. Another important attraction was the automatic transmission session. A. H. Deimel, chief engineer of Hydraulic Transmission Div., Spicer Mfg. Div. of Dana Corp., analyzed current automatic transmissions and the future trend of this development. A paper on the new Mercury-Ford automatic transmission was presented by H. T. Youngren, vice-president of engineering, and H. G. English, assistant research engineer, Ford Motor Co. This transmission was described in the June 15 issue of AUTOMOTIVE INDUSTRIES in Part VII of the automatic transmission series.

During the meeting power-assist steering was demonstrated by the Saginaw Steering Gear Div. of General Motors, Ross Gear and Tool Co., and Francis W. Davis, consulting engineer. Buick, Studebaker, and Cadillac cars, respectively, were equipped with these hydraulic mechanisms.

The round-table sessions provided excellent forums

The Elimination of Combination Knock—Texaco Combustion Process

By E. M. Barber and W. T. Tierney, The Texas Co., and Blake Reynolds, Texaco Development Corp.

THE information now at hand, without considering the possible future developments, is sufficient to consider a multicylinder TCP (Texaco Combustion Process, see AUTOMOTIVE INDUSTRIES, May 15, 1947, page 27) engine for operation in an automobile and to make an accurate estimate of its resultant performance. The most elementary form of TCP engine—four stroke cycle, poppet valve, naturally aspirated—will exploit a minimum of TCP's potential. However, it offers a fair basis for a preliminary comparison. Fig. 1 shows a comparison between the high gear performance of a popular automobile powered by its conventional 6.6 to 1 compression ratio engine and by a TCP engine of 9.65 to 1 compression ratio. Although doing so somewhat minimizes TCP's performance advantages the TCP performance is predicted on using the same bore, stroke and gear ratio as the conventional engine. From Fig. 1, it is apparent that the TCP engine will at least equal the full throttle performance of the conventional engine; and that, with normal driving habits, the fuel economy of the TCP engine will be of the order of 30 per cent greater than with the conventional engine. The conventional engine requires a "Regular" motor fuel while the TCP engine would operate on a fuel having no Octane Number specification and a broad boiling range.

At one time or another during the development work TCP engines have been operated extensively on fuels meeting specifications for motor gasoline, Diesel fuel, ANF-58 jet engine fuel, tractor fuel, aviation gasoline, Navy special fuel oil, etc., and it appears that any of these might be used

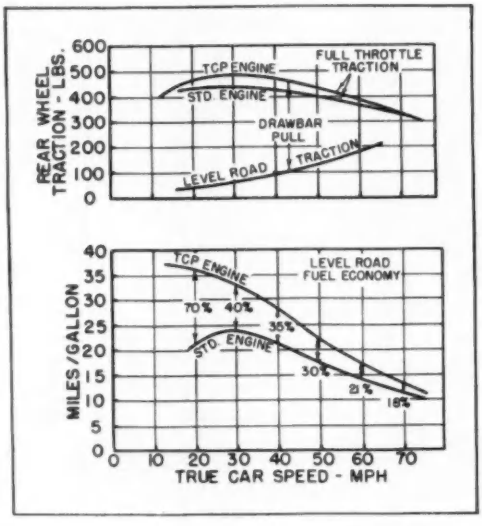


Fig. 1—Comparative high gear performance of a popular car, powered by its standard engine and a naturally aspirated TCP engine, both of the same displacement.

French Lick Meeting

By James R. Custer

for the specialists to discuss common problems and to ask questions, to many of which no conclusive answers were given. The session on wear of pistons, rings, cylinders, etc., was typical of this situation due to the many variables that are present.

The fatigue and service testing round-table brought out an important point—the difficulty of outlining test procedures that can be correlated with actual service. On the subject of cooling systems, it was disclosed that experimental work is being done on passenger cars with pressures of 25 to 40 psi.

From the discussion of the question, "Do we need higher voltages for automobile electrical systems?" it was indicated that if compression ratios go above 8 to 1, important improvements will have to be made to the electrical systems, regardless of cost considerations, to cope with increased power requirements for cranking and for ignition. One approach considered was adopting the 12-v system.

Special extracts from as many of the technical papers as space permits are presented on this and the following pages.

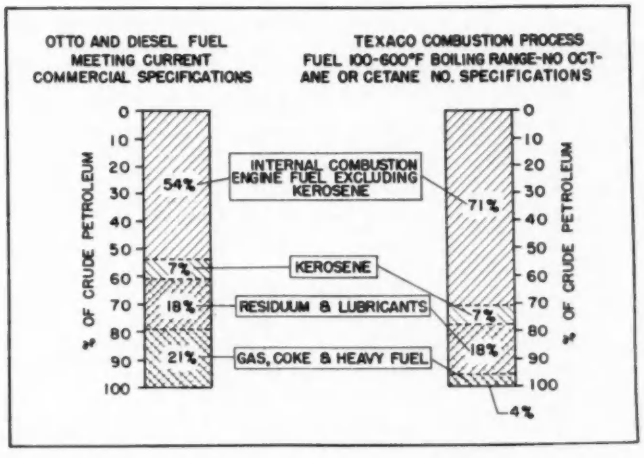


Fig. 2—Yields of fuels in two cases as specified in the text.

as desired. If a fuel were to be made for TCP engines it should be predicated on maximum yield from crude oil and on minimum processing losses and costs. A clean fuel, of some 100 to 600 F boiling range and having no octane or cetane number specification would be suitable to the engine and near to maximum availability. As an example, the data presented by Fig. 2 has been prepared to show yields of internal-combustion engine fuel obtained in two cases (1) when manufactured to 1946 commercial gasoline and Diesel fuel specifications and (2) assuming manufacture of a fuel of the type considered for TCP. It will be noted from Fig. 2, that there is a significant improvement in the yield of internal-combustion engine fuel in the latter case. An example, such as the above, involves a certain degree of uncertainty as to how far it applies in general practice, and doubtless certain exceptions can be found depending on the properties of the crude petroleum to be processed and the refinery equipment available for that processing. This particular example was for an actual crude which is in good supply and the processing proposed is that of a large and modern refinery. The example is thought to be indicative of the general situation.

Automatic Transmissions Today—Tomorrow

By A. H. Deimel, Chief Engineer, Hydraulic Transmission Div., Spicer Mfg. Div., Dana Corp.

HAVING examined the automatic transmissions of today, can we venture an estimate of what lines the automatic transmissions of the future can be expected to follow? We have seen the advantages provided by hydrokinetic drive, smoothness of starting which is continually repeated without necessity of adjustment since the smoothness is inherent in the principles used. With the converter, we also obtain a flexibility over the driving range, with the speed and torque ratios adjusting themselves in accordance with

TABLE I—ANNEALING PRACTICE FOR REAR AXLE GEAR STEELS

Manufacturer	Drive Pinion		Ring Gear		Side Gear	
	SAE Steel	Treatment	SAE Steel	Treatment	SAE Steel	Treatment
A	8617	Normalize 1775 F	8615	Normalize 1775 F	5130	Normalize 1650 F
B	4620	Cycle Anneal 1750-1750-1175-1175-800-600 F	4620	Cycle Anneal 1750-1750-1175-1175-800-600 F	1019-1022	Normalize 1700 F
C	4620H	Cycle Anneal 1800-1150 F	4620H	Cycle Anneal 1800-1150 F	8620H	Cycle Anneal 1800-1150 F
D	8620	Cycle Anneal (1650-1700)-1220-1200-1180 F	8620	Cycle Anneal (1650-1700)-1220-1200-1180 F	8620	Cycle Anneal (1650-1700)-1220-1200-1180 F
E	4620	Cycle Anneal 1750-1825-1150-1000 F	4620	Cycle Anneal 1750-1825-1150-1000 F	1024	Bar Stock
F	1024	Normalize 1650 F	1024	Normalize 1650 F	1024	Normalize 1650 F
G	4028	Forging Temperature to salt bath-1190 F for Transformation	8620H	Forging Temperature to salt bath-1190 F for Transformation	8620H	Forging Temperature to salt bath 1190 F for Transformation
H	4028	Cycle Anneal at or above 1700 F for 2½ hours. Cool to 1100 F in 10 min.	4028	Cycle Anneal at or above 1700 F for 2½ hours. Cool to 1100 F in 10 min.	4032	Cycle Anneal at or above 1700 F for 2½ hours. Cool to 1100 F in 10 min.
I	4620H	Normalize 1700 F	4120 Mod.*	Normalize 1700 F Temper 1275 F	1137	Cycle Anneal 1500-1550-1130-1100-1075 F

* Modification of the Former SAE 4120 Specification.

TABLE II—HEAT TREATMENT FOR REAR AXLE GEAR STEELS

Manufacturer	Part Name	SAE Steel	Method	Case Depth (Inches)	Quench Medium	Tempering Temp., °F
A	Drive Pinion	8617	Pack Carburize	.045-.060	Oil	325
	Ring Gear	8615	Pack Carburize	.040-.055	Oil	325
	Side Gear	5130	Carbonitride	.005-.015	Oil	325
	Side Pinion	5130	Carbonitride	.005-.015	Oil	325
B	Drive Pinion	4620	Gas Carburize	.050-.055	Oil	300
	Ring Gear	4620	Gas Carburize	.050-.055	Oil	300
	Side Gear	1019	Pack Carburize	.050-.055	Caustic	350
	Side Pinion	1022	Pack Carburize	.050-.055	Caustic	350
C	Drive Pinion	4620H	Gas Carburize	.043-.048	Oil	None
	Ring Gear	4620H	Gas Carburize	.043-.048	Oil	None
	Side Gear	8620H	Gas Carburize	.043-.048	Oil	None
	Side Pinion	8620H	Gas Carburize	.043-.048	Oil	None
D	Drive Pinion	8620	Gas Carburize	.040-.050	Oil	None
	Ring Gear	8620	Gas Carburize	.040-.050	Oil	None
	Side Gear	8620	Gas Carburize	.025-.035	Oil	None
	Side Pinion	8620	Gas Carburize	.025-.035	Oil	None
E	Drive Pinion	4620	Gas Carburize	.040-.050	Oil	None
	Ring Gear	4620	Gas Carburize	.040-.050	Oil	None
	Side Gear	1024	Gas Carburize	.040-.050	Oil	300
	Side Pinion	1024	Gas Carburize	.040-.050	Oil	300
F	Drive Pinion	1024	Gas Carburize	.030-.040	Oil	350
	Ring Gear	1024	Gas Carburize	.030-.040	Oil	None
	Side Gear	1024	Gas Carburize	.025-.030	Oil	350
	Side Pinion	5120	Gas Carburize	.025-.030	Oil	350
G	Drive Pinion	4028	Gas Carburize	.045-.055	Oil	375
	Ring Gear	8620H	Gas Carburize	.045-.055	Oil	375
	Side Gear	8620H	Gas Carburize	.030-.040	Oil	375
	Side Pinion	8620H	Gas Carburize	.030-.040	Oil	375
H	Drive Pinion	4028	Gas Carburize	.040-.050	Oil	None
	Ring Gear	4028	Gas Carburize	.040-.050	Oil	350
	Side Gear	4032	Gas Carburize	.030-.040	Oil	350
	Side Pinion	4024	Gas Carburize	.030-.040	Oil	350
I	Drive Pinion	4620H	Pack Carburize	.040-.050	Oil	None
	Ring Gear	4120*	Pack Carburize	.040-.050	Oil	325
	Side Gear	1137	Carbonitride	.015-.025	Oil	None
	Side Pinion	1016	Pack Carburize	.040-.050	Water	None

* Modification of the Former SAE 4120 Specification.

Highlights of

TABLE III—AUTOMOTIVE TRANSMISSION GEAR STEELS IN CURRENT USE
(SAE Steel Designation)

Manufacturer	Counter Gear	Clutch Gear	Low Speed Gear	2nd Speed Gear	Idler Gear
A	5145	5145	5145	5145	5145
B	4640H	4640H	4640H	4640H	4640H
C	8620	8620	8620	8620	8620
D	1320	1320 or 8620	1320	1320	1320
E	1024	1024	1024	1024	1024
F	5135H	5135H	5135H	5135H	5135H
G	4032[a]	4032[b]	4032	—	4032
H	1340H	1340H	1340H	1340H	1340H

[a]—Counter Shaft Gears.
[b]—Drive Pinion.

TABLE IV—ANNEALING PRACTICE FOR TRANSMISSION GEAR STEELS

Manufacturer	SAE Steel	Method	Temperature, °F
A	5145	Cycle Anneal	1650-1260
B	4640H	Cycle Anneal	1800-1200
C	8620	Cycle Anneal	1650-1700-1220-1200-1180
D	1320	Cycle Anneal	1750-1825-1150-1000
E[a]	1024	Normalize	1650
F[b]	5135H	Forging Temperature to Salt Bath	Transformation Temperature 1260
G	4032	Cycle Anneal	At or above 1700—2½ hours—cool to 1100 in 10 min.
H	1340H	Cycle Anneal	1475-1600-1130-1170

[a]—Second Speed and Idler Gears Not Normalized.
[b]—Idler Gear Normalized 1850 F.

TABLE V—HEAT TREATMENT FOR TRANSMISSION GEAR STEELS

Manufacturer	SAE Steel	Method	Case Depth (Inches)	Quench Medium	Tempering Temp., °F
A	5145H	Cyanide	—	Oil	480
B	4640H	Gas Carburize	.008-.012	Oil	425
C	8620	Gas Carburize	.040-.050	Oil	325-340[a]
D	1320	Gas Carburize	.040-.050	Oil	350
E	1024	Gas Carburize	.025-.030 .030-.040[b]	Oil	350
F	5135H	Gas Carburize	.008-.012 .012-.016[c]	Oil	360
G	4032	Gas and Pack Carburize	.030-.040	Oil	400[d] 480[e] 600-620[f]
H	1340H	Carbonitride	.005-.010	Oil	450

[a]—Some Hot Quenched in Oil.
[b]—Low and Second Speed Gears.
[c]—Clutched Gear.
[d]—Drive Pinion Gears.
[e]—Countershaft and Low Speed Gears.
[f]—Reverse Idler Gear.

TABLE VI—AUTOMATIC AND SEMIAUTOMATIC TRANSMISSION GEAR PRACTICE

Manufacturer	SAE Steel	Annealing Treatment	Hardening Method	Case Depth (Inches)	Quench Medium	Tempering Temp., °F
A	5145	—	Carbonitride	.007-.010	Oil	440
B	1141	—	Induction	—	—	700
	8140H	Cycle Anneal (1600-1625)-1325-1200-1100F	Gas Carburize	.004-.007	Oil	325
	5140H	Cycle Anneal (1600-1625)-1325-1200-1100 F	Neutral Atmosphere	—	Oil	500
	5145H	Bar Stock	Gas Carburize	.005-.010	Oil	500
C	1024	—	Gas Carburize	.025-.030	Oil	350
	8620H	Normalize 1650 F Temper 1250 F	Gas Carburize	.025-.030	Oil	350
D	4032	Cycle Anneal at or above 1700 F for 2½ Hr. Cool to 1100 F in 10 Min.	Gas Carburize	.030-.040	Oil	400
E	1052	Quench 1550 F Oil, 1180-1220 F Temper	Induction	.025-.050 Below Root of Tooth	Oil	480
	1330H	Bar Stock	Gas Carburize	.008-.012	Salt	450

TABLE VII—FLYWHEEL RING GEAR PRACTICE

Manufacturer	SAE Steel	Annealing Treatment	Hardening			Tempering Temp., °F
			Method	Temp., °F	Quench	
A	1050	Normalize 1430 F	Furnace	1550	Oil	740
B	1045	Furnace Cool From 1600 F	Flame	—	Oil	None
C	1045	None	Flame	—	Oil	None
D	1050	Anneal 1450 F	Flame	—	Oil	None
E	1048	Anneal 1650 F	Induction	—	Water	500-600
F	1045	Normalize 1650 F	Flame	—	Water	500-550
G	1045	Normalize 1600 F	Induction	—	Water	600-625

Automotive Gear Steels and Their Heat Treatment

By V. E. Hense, H. H. Miller, and R. B. Schenk, Buick-GM.

A SURVEY was made of several automotive manufacturers* to secure a comparison of current practice on gear steels and their heat treatment. The information includes data on steels used for rear axle, transmission and flywheel ring gears. In the transmission group gears for the conventional, semi-automatic and automatic types are listed. Current heat treatments including annealing, carburizing, hardening and tempering are outlined in the accompanying tables on this and the preceding page. This comparison of current practice shows what each manufacturer has found to best satisfy requirements and, as such, must be assumed as representing economy in the selection of steels and heat treatments.

* Buick, Cadillac, Chevrolet, Chrysler, Detroit Transmission Div. of G.M., Ford, Nash, Packard, Pontiac and Spicer.

the power demand as indicated by the throttle opening. With engine speed thus not tied rigidly to vehicle speed, we obtain continuous smooth acceleration. The actual shifts required are reduced to a minimum and are accomplished with maximum smoothness.

With these advantages in mind it is logical to assume that future automatic transmissions will continue the trend to hydrokinetic drive. With further research in blading, we can, of course, expect further improvement in performance, but beyond this, can we look to any improvement in principle?

The speed ratio and torque ratio are initiated by and dependent on throttle opening. Thus for any reduction in acceleration we must first reduce the throttle opening. The gasoline engine produces its best economy at or near full throttle opening. This fact accounts for some of the increased fuel economy with overdrive. Before and after engaging overdrive, with the vehicle operating at the same constant speed, the same horsepower must be developed. With the overdrive, the engine is running slower but with a greater throttle opening, and thereby producing the horsepower more economically.

We now regulate our vehicle speed by throttle opening. We formerly regulated the spark advance by hand. Just as the spark advance is now regulated automatically, it is conceivable that eventually throttle position and speed and torque ratio will also be regulated automatically, subject merely to the command of a speed control pedal. In this manner, engine speed would be determined by the ratio needed to meet the power requirements, operation being to a greater extent at lower engine speed and wider throttle opening, with resultant better fuel economy. Change in power requirements would be met by a change in ratio over a predetermined range before making a change in throttle opening.

Hydrostatic transmissions permit performance of this type but their high losses in sizes suitable for automotive work have prevented their application. To produce this type of performance with a torque converter some form of external control on the flow must be made available. Attempts made so far to accomplish this purpose have not been successful, since they were accompanied by reduced efficiency, which offset any gain made. It is, however, a direction in which improvement in performance can be found, and is therefore worthy of effort.

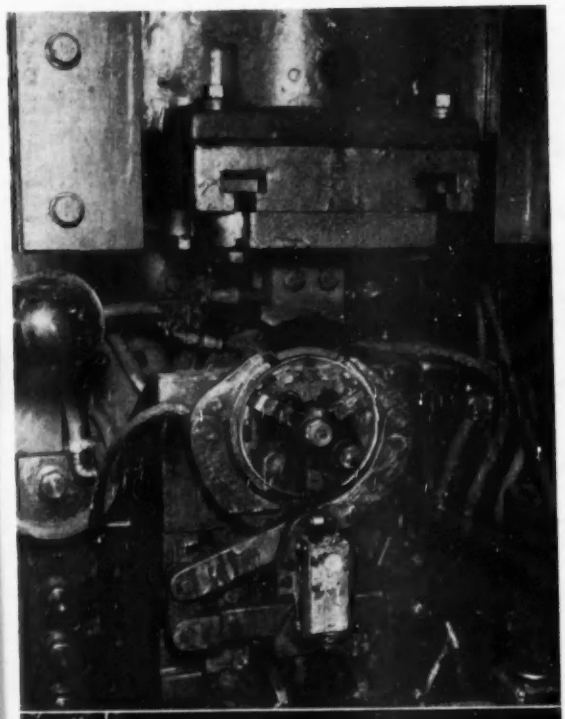
Precombustion Reactions in a Motored Engine

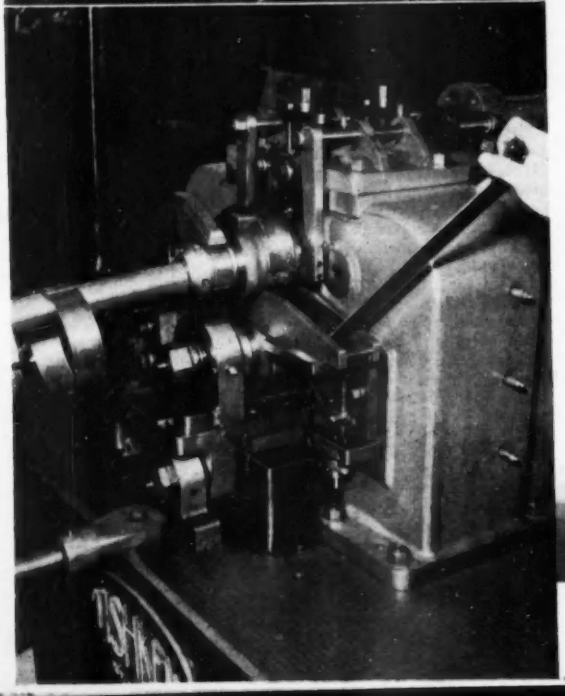
By D. L. Pastell, Petroleum Laboratory, E. I. du Pont de Nemours & Co., Inc.

THE most obvious method of studying knock is through experiments with an operating engine under knocking conditions. Such investigations, how-

(*Turn to page 80, please*)

Dynaflow Brake Band *Simplified*





By Joseph Geschelin

WHEN Buick introduced its Dynaflow drive, manufacturing procedures had to be devised the hard way—as is the lot of the pioneer—since there was no precedent to go by. From an engineering standpoint the important thing was to make parts that would stand up without question and give adequate performance regardless of initial cost considerations.

Meanwhile Buick has been busy studying each of the elements of the drive to improve quality, simplify manufacturing procedures, and reduce costs. One of the fruits of this program is the newly tooled brake band assembly, the subject of this article. Although this band is physically interchangeable with the previous type, it is considerably simpler to produce, costs less, and promises enhanced quality and serviceability.

To introduce the process briefly, consider that the new band consists of precision-rolled strip stock which is rolled into circular form. To this is added a press-formed lug projection—welded to

1. *Close-up of the Tishken machine for roll-forming of bands. The operator at the extreme right is inserting the flat band with pre-formed ends ready for the next operation.*

2. *This is the work station of the big Federal projection welder which welds the formed lug—seen at the top, above the open joint—to the band.*

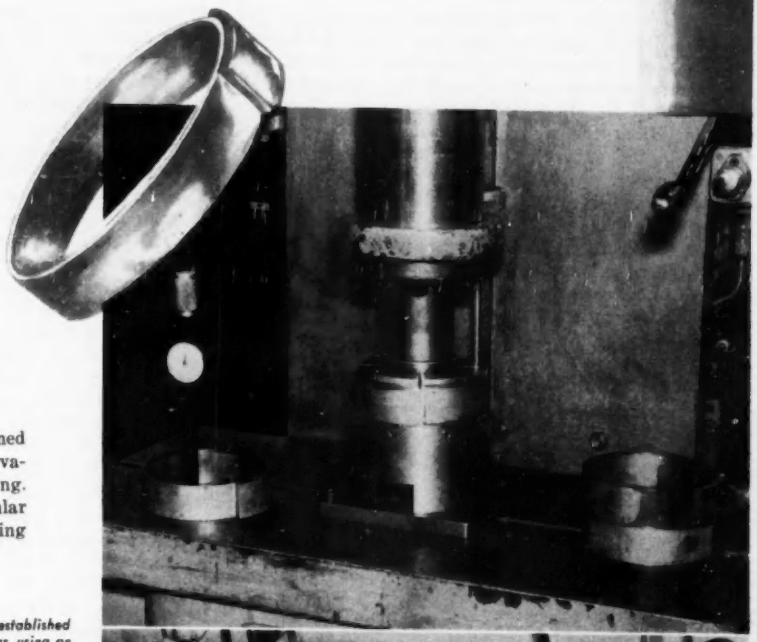
and Improved

the band, then hydrogen-brazed to provide still greater shear strength. The only formal machining required is the surface broaching of the lug to form. Later the friction lining—pre-coated with the cement—is bonded to the band and machined.

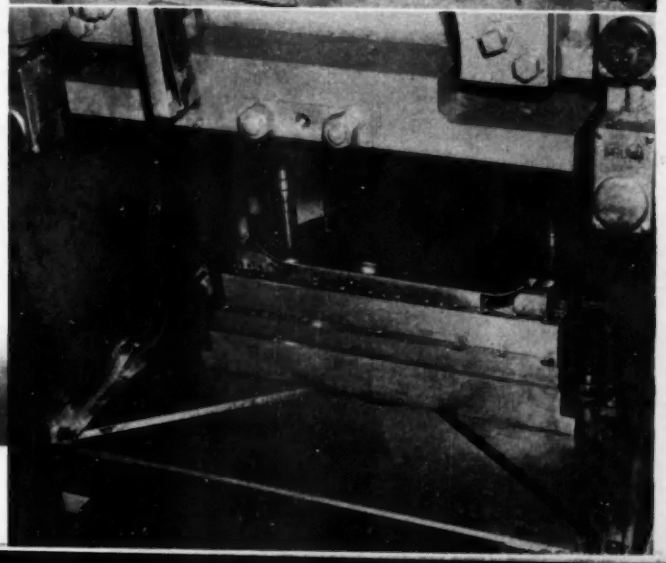
With this introduction, consider the highlights of the process in more detail.

Material for the band consists of precision cold-rolled SAE 950 N-A-X steel strip, 0.128 in. thick, held to plus or minus 0.002 in., and delivered in specified mill lengths. The strip is cut to proper gage length, five strips at a time, in a special Motch & Merryweather saw, using a 10-in. triple-chip, HSS circular saw with 90 teeth. While in flat form the strip has a series of projection spots embossed at both ends in a small press. These spots serve as focal points for projection welding later on.

The strip is fed to a 125-ton Verson All-Steel press in which both ends are preformed to the specified radius of curvature, prior to roll-forming. Then it is rolled into circular form in a Tishken rolling



3. *Circularity of the band is established in this 50-ton American press, using an expanding arbor exerting a swaging pressure of some 50 000 psi. The band is expanded about 0.050 in. in this operation.*



4. *Loading end of the 60-ft General Electric hydrogen brazing furnace in which the previously welded lug is copper-brazed for an enduring bond. The loading end holds two trays of bands, one ready to enter the furnace, the other to follow.*

Dynaflow Brake Band Simplified and Improved

machine. The rolls for this machine are relieved by means of grooves to clear the projections embossed in the ends.

Material for the lugs is received in the form of SAE 1030 cold-drawn strip, 0.343 in. thick plus 0.000, minus 0.006 in. in unit lengths which are cut to specified length in a Campbell abrasive cut-off machine. The individual pieces are press-formed to proper radius to fit the curvature of the band closely. They are tumbled in Globe wet tumbling barrels to remove sharp edges prior to welding.

In preparation for welding both bands and lugs go through a Detrex vapor degreaser, using Perm-A-Clor and Triad solvents for a thorough chemical cleaning job. Bands and lugs meet at the Federal projection welder where the lug is joined to the band. Upon emerging from the welder, the sub-assemblies go directly to the adjacent General Electric hydrogen brazing furnace.

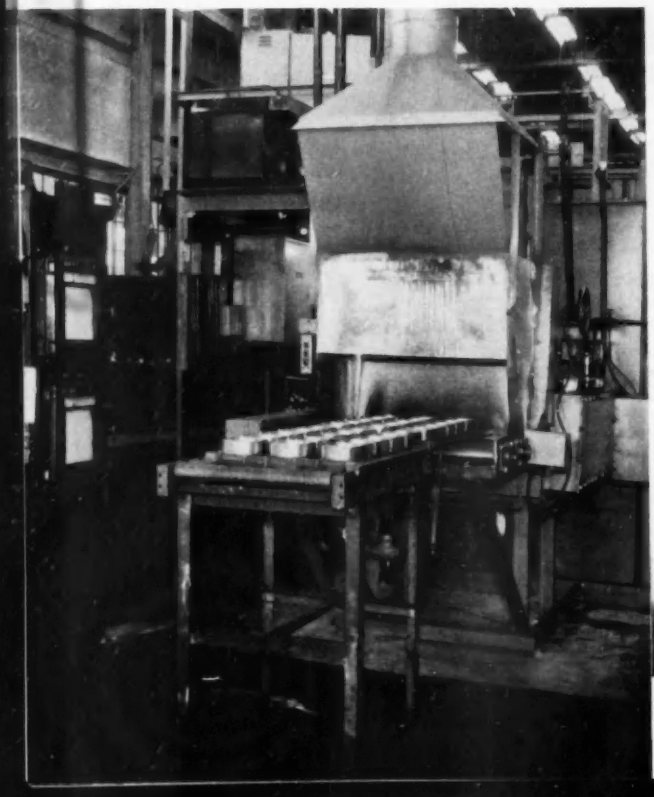
This furnace is about 60 ft in length, including loading and unloading stations, and has two high temperature heating zones and a long cooling tunnel. It is of roller hearth construction with the atmosphere provided by a Surface-Combustion RX gas generator. A temperature of 2030 F is maintained in the two heating zones. The work is fed into the furnace on grid type trays, each one holding 15 bands. At the loading station the operator prepares two trays at a time, one tray being loaded into the furnace at a time while a completed tray is discharged at the exit end.

Altogether the furnace holds 15 trays at a time so that 225 pieces are in process during a given cycle. Weight of a tray and load is approximately 50 lb. The cycle is so timed that one tray is completed every four minutes, thus producing 225 pieces an hour. As is common in all hydrogen brazing operations, it took considerable work to determine exactly the amount of copper required to do a perfect bonding job without leaving excess to be machined off. Now they have a standard copper strip which is clipped onto the lug before the tray enters the furnace.

The sub-assembly now is ready for machining. First operation is to grind the sides of the band parallel and to gage size, this being done in a No. 226, 30-in. Besly double disk grinder fitted with a rotary indexing work holding fixture. All edges then are burred in a Hammond six-station burring machine. Next comes the truing operations required to verify the conformity of the band. The first step is the forming of the lug area to proper radius in a 15-ton Oilgear press. This is followed by swaging the band to size with an expanding die mounted in a 50-ton American hydraulic press. Swaging involves a pressure of 50,000 psi, expanding the band some 0.050 in. on the diameter.

Broaching of the lugs on the face and sides follows in a single pass of the ram in the Cincinnati 10-66 Duplex Hydro-Broaches used heretofore. Chief difference is that whereas the lugs originally required two separate operations, they are finished in one pass, permitting two pieces to be handled in a single machine. Following some minor operations, the bands are washed in a new Ransohoff

(*Turn to page 74, please*)



5. *View of the 125-ton Verson press which is used for preforming both ends of the flat, embossed, strip to the proper radius of curvature for feeding the roll-forming machine.*

Many Improvements in Ford Tractor Engine

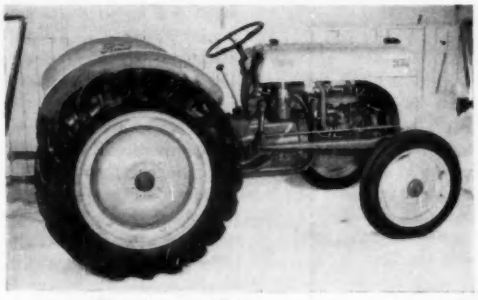
RECENT improvements have been made in the 8N Ford tractor engine which not only increase its power and efficiency but at the same time improve accessibility of some of its accessories. Belt horsepower is 20 per cent greater than that of the early 8N tractor and drawbar horsepower has been increased 12 per cent.

Pistons now have a higher dome which, together with a redesigned cylinder head, increases the compression ratio from 6.2 to 1 to 6.37 to 1. Valves are of the straight-stem type, thus permitting use of one-piece valve guides. Neoprene seals on the intake valve guides prevent oil leakage at this point. Top compression rings are chrome plated. Cam lobes have been changed to admit a larger charge at all speeds.

The new distributor has been changed from a direct drive to a side-mounted, angle drive type for easier servicing and reduced condensation. Degree marks on the flywheel and a window in the flywheel housing facilitate checking ignition timing. Greater output is obtained from a two-brush generator with a voltage-current regulator than from the three-brush unit with a voltage regulator which it replaces.

Maximum oil pressure, which is governed by a relief valve, remains unchanged, but better lubrication at low and medium engine speeds is provided by an oil pump of 22 per cent greater capacity. Cooling has been improved by a new four-blade fan and by enlarged water passages in the cylinder block.

Many refinements such as a new clutch designed for more economical servicing and a redesigned muffler which reduces step plate temperature by about 30 F have been incorporated in the tractor to reduce upkeep costs and to increase ease of operation.



Latest model 8N Ford tractor

Quick Reversal of Electric Motors

A METHOD for reversing a small electric motor in three to four milliseconds has been developed recently by the National Bureau of Standards. While it is relatively easy to stop a motor quickly by the use of brakes, rapid starts are limited by the low torques which can be obtained by electromagnetic means alone. In the Bureau's rapid-reversal motor, the kinetic energy of the rotor, instead of being dissipated as heat in a brake during deceleration, is converted into potential energy in a spring, which is then used to accelerate the rotor rapidly in the cpposite direction.

For experimental purposes a small, low-inertia, two-phase motor operating at 3200 rpm was used. The reversal spring consists of a steel torsion bar approximately 31 in. long and 3/16-in. in diameter. Only one phase of the motor is connected to the a-c power supply; thus the motor will rotate in the starting direction, either clockwise or counter-clockwise. The motor shaft is rigidly connected to one end of the torsion bar, which is equipped at the other end with two positive unidirectional clutches. One clutch prevents clockwise, and the other counterclockwise, rotation. If the motor is rotating in a clockwise direction and the proper clutch is engaged, the adjacent end of the torsion bar is thereby stopped and, with this setup, the rotor is brought to a stop in approximately 20 deg. Potential energy stored in the torsion bar is then returned to the rotor in the form of a counterclockwise impulse. Time for the motor to attain virtually full speed in the new direction is about two milliseconds.

In the experimental model of the rapid-reversal mechanism built at the Bureau, the clutches are operated manually, but it is expected that in normal use the clutch mechanism will be operated by suitable electromagnetic controls. Although the studies thus far have used a small motor of about 1/75 hp, it is anticipated that motors of all sizes could be reversed rapidly by this technique, the speed of reversal being limited only by the mechanical strength of the various parts. Moreover, by use of suitable circuitry, rapid reversal of motors can be obtained without producing large current surges in the electrical supply lines.

It would be entirely feasible to utilize other types of energy-storing devices, such as coil springs or pneumatic cylinders, instead of the torsion shaft. It would also be possible to use a stationary energy-storing system and to locate the reversing clutches between it and the motor shaft.

Design Analysis

By Prof. A. K. Oppenheim and Prof. A. L. London

Dept. of Mechanical Engineering, Stanford University

STANFORD University has been performing research work on a free-piston engine for the Navy Department Office of Naval Research, and this article is based on the first major report that has been released since the outset of the program. Although the free-piston gas generator turbine system is a revolutionary internal combustion engine development it is by no means new since Pescara, a Frenchman, invented the free-piston engine over 20 years ago. Renewed interest in development of the engine is due to recent successful German and French applications. At present there is at least one major U. S. company engaged in free-piston engine development, and a productive effort is being made in France.

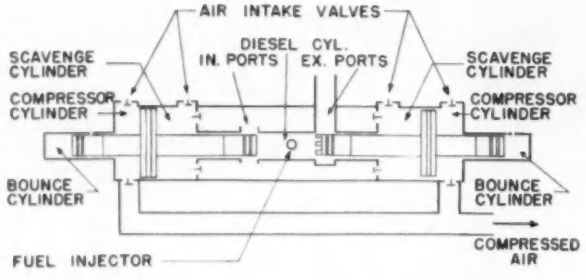


Fig. 1a—One fundamental use of a free-piston engine is for a compressor system. The Diesel engine is not supercharged for this application.

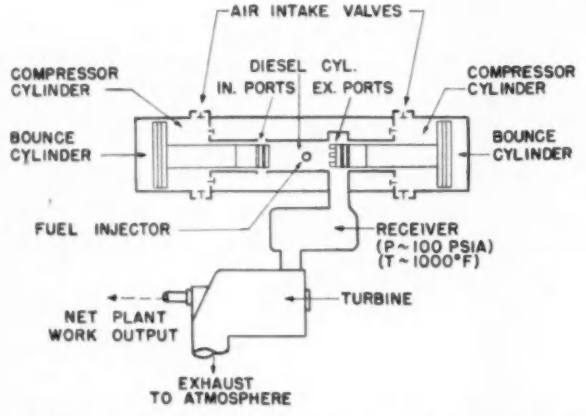


Fig. 1b—A gas-generator-turbine system is another use for the free-piston engine. For this purpose the Diesel engine operates with a high supercharge of approximately five to seven atms.

A free-piston system consists of an opposed piston two-stroke cycle, crankless engine operating on the Diesel principle with the engine pistons connected directly to an integral air compressor. Reciprocating motion of the engine is directly used to provide the compressor piston work requirement. Most notable mechanical features of the free-piston system are constructional simplicity arising from the absence of connecting rods, crankshaft, and associated bearings, the essentially vibration free operation provided by the opposed piston crankless design, and reduction of cylinder wear since side thrust is due only to gravity. These advantages are gained with no sacrifice of thermodynamic performance since thermal efficiencies are comparable to or even better than those of the Diesel engine.

There are two principal

# of Free-Piston Engines

applications for which the free-piston system is suited. One is for use as an internal combustion engine air-compressor combination where the useful output is compressed air for pneumatic purposes, and the other is for use as an air-compressor combustion chamber combination for the production of hot pressurized gases for use in a turbine for the derivation of shaft work.

For the compressed air application the engine may operate with a nominal supercharge sufficient for scavenging of the cylinder. However, for the power gas generator application, the engine operates with a high supercharge derived from the compressor discharge flow and exhausts at a high back pressure just slightly less than the supercharge pressure. These two fundamental applications of the free-piston principle are illustrated schematically in Figs. 1a and 1b. Additional parts such as synchronizers, starting mechanism, and stabilizers are not shown on the illustrations.

Design procedures based on the thermodynamic-dynamic analysis of free-piston engines are sufficiently complex and different from that of the conventional crankshaft system, so that the lack of such information has inhibited preliminary thinking on the subject by most of the engine manufacturers of this country. In the conventional engine, by virtue of the mechanical constraints imposed by the crankshaft, speed of rotation and compression ratio become independent variables to the designer. This allows a complete separation of the thermodynamic and the dynamic considerations. In many cases the only thermodynamics that the internal combusion engine designer may use is a selection of a practicable mean-effective-cylinder-pressure determined from previous experience. This fixes cylinder bore and stroke, and the remainder of the design is established primarily from mechanical considerations. For the free-piston engine, however, the absence of a crankshaft results in a spring-mass system which operates at a natural frequency established by the mass of the piston assemblies and the nature of the gas springs within the

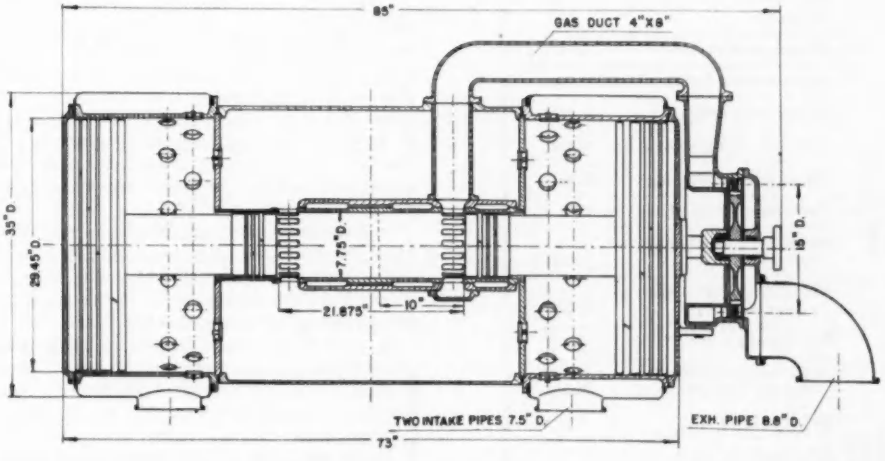


Fig. 2—This schematic drawing shows the approximate dimensions of a 1000 shp free-piston gas generator-turbine which has a gas generator cycle frequency of 847 cpm, turbine speed of 10,000 rpm, gas flow rate of 19,800 lb per hr, gas pressure to turbine of 92.6 psia, gas temperature to turbine of 1523 Fabs, and a specific fuel consumption of 0.333 lb per turbine hp-hr. Space required by the piston synchronizing mechanism is not considered.

cylinders. Consequently, thermodynamical and dynamical considerations cannot be conveniently separated.

Design Problem

The design problem dealt with at Stanford was concerned primarily with thermodynamic-dynamic analysis, and was stated specifically as follows: Determine the full load operating characteristics and cylinder bores of a symmetrical, one-stage, direct bounce (Fig. 1b), free-piston gas generator having sufficient capacity for the operation of a 1000-hp turbine.

Solution of such a problem requires a determination of the numerical values for the thermodynamic state and flow rate of the generated gas, cylinder bores, stroke length, cycle frequency, fuel and air flow rate, thermal efficiency and fuel economy.

Thermodynamic analysis was, as a matter of convenience for this study, based on one lb of air delivery per cycle for each of the two compressor cylinders acting in parallel. Then, still on this unit basis, the times for the out and in-strokes were determined and the system's natural frequency of operation was established. Gas generator outlet temperature and pressure are known from the thermodynamic analysis, therefore, the resulting delivery flow rate can be determined. With the known frequency of operation and the affinity relations, derived in this study, the cylinder dimensions for the one lb per cylinder cycle delivery can be scaled down to give the required flow rate.

Table 1

Independent Variables

A. System
1. Net power output: 1000 shp.
2. Stroke length: 10 in.
3. Piston length: L = 2 ft (compressor, 0.5 ft; engine, 1.5 ft).
4. Piston average bulk density: ρ = 485 lb/ft³ (corresponding to solid steel pistons i.e. 100 per cent solidity).

B. Compressor
1. Pressure ratio: 6.982 : 1
2. Clearance: 7 per cent
3. Air intake state: P_o = 14.70 lb/in.² abs.; T_o = 540 F abs.

C. Engine
1. Air-fuel ratio: 29 : 1
2. "Effective" stroke: 7.50 in.
3. Lower heating value of fuel: 18,200 BTU/lb

Table 2

Summary of Results for the Basic Design of the Free-Piston Gas-Generator-Turbine System.

Gas Turbine	Power, hp	1000
	Gas flow rate, lb per hr	19,800
	Gas pressure to turbine, psi abs	92.6
	Gas temperature to turbine, F abs	1523
Gas Generator	Stroke, in.	10
	Engine piston area, sq ft	0.3273
	Engine cylinder bore, in.	7.75
	Bounce piston area, sq ft	4.7259
	Compressor piston area, sq ft	4.3986
	Bounce cylinder bore, in.	29.45
	Piston mass (100% solidity), lb	1385
	Air del. per compressor cyl x cycle, lb	0.1925
	Ratio of engine air to compressor air	0.3425
	Cycle frequency, cpm	847
	Engine indicated thermal efficiency (LHV Basis), %	34.2
Gas Generator Turbine System	Fuel rate, lb per hr	333
	Economy, lb per shp hr	0.333
	Thermal efficiency (LHV Basis), %	42.0

Basic Design

A numerical solution of the design problem was achieved and the result is referred to as the basic design. Numerical values of the independent variables are given in Table 1 and a summary of the most important results in Table 2. One of the most interesting results is the fact that the turbine shaft thermal efficiency of 42 per cent is higher than the Diesel engine indicated efficiency of 34.2 per cent. Since both are based on the same energy input, it means that the shaft horsepower of the gas generator-turbine system is higher than the indicated engine horsepower, as opposed to the relationship between these quantities for any other reciprocating internal combustion engine with mechanical power transmission from the engine cylinder to the shaft.

Comparatively high thermal efficiency of the system, based on quite reasonable assumptions of all losses as they may appear in practice, is also worth noting. Ultimate validity of this figure, however, can only be ascertained by a performance test.

In order to give some idea of the plant dimensions and weight, the results of the 1000 shp gas generator-turbine system are supplemented with an overall design layout including the turbine, Fig. 2. The turbine consists of two impulse velocity stages and operates at 10,000 rpm. Size of the turbine and of the ducting is much smaller than that of a normal stationary gas turbine plant corresponding to the same power output and speed. The reason for this is that the specific flow rate of the gas generator-turbine cycle is of the order of 20 lb per shp hr; whereas for the conventional

stationary gas turbine plant, it is about 40 to 60 lb per shp hr. This relatively high specific flow rate of the conventional gas turbine system stems from the fact that in such a system the net work is only about one-third the gross work, the remainder being fed back to the compressors; whereas in the free-piston gas generator-turbine system, compression is performed by the generator and net work is equal to the total turbine output. The duct shown in Fig. 2 was designed for an average gas velocity of 150 fps. If the capacity of the duct is not sufficient to damp down the oscillations of the gas generator output, the system may be supplemented with a suitable surge reservoir.

According to the result of the analysis, the whole 1000 shp plant could be accommodated in a cylindrical space of about seven ft long and three ft diam. However, the mechanical requirement for the linkage synchronizing the two piston assemblies may necessitate more longitudinal space than the seven ft indicated.

Overall weight could be evaluated on the basis of an assumed solidity of, say 40 per cent—the same order as that of a Junkers free-piston compressor, which is at present on the test stand in the mechanical laboratory at Stanford—resulting in a weight of 13,000 lb or 13 lb per shp specific weight. This figure compares favorably with the corresponding estimate of 30 lb per shp for a conventional gas turbine plant with an intercooler and regenerator of sufficient size to yield a thermal efficiency of approximately 30 per cent.

Affinity Relationships

By the use of affinity relationships derived in this study, design results can be extrapolated for prediction of cylinder sizes and operating frequency for any shp output maintaining the same thermodynamic idealizations and operating conditions.

As an example, the relations between the turbine horsepower output, hp; cycle frequency, f; engine or compressor cylinder bore, D; stroke, s; piston length, L; and piston average bulk density, ρ; are shown to be: f varies directly as $1 \div \sqrt{sL\rho}$ and hp varies directly as D^2s which varies directly as $D^2\sqrt{s/L\rho}$.

It was found, Table 2, as a result of the basic design analysis by means of affinity relations, that a 1000 shp unit with a stroke $s_1 = 10$ in. and a piston solidity of 100 per cent, has a compressor cylinder diameter $D_1 = 30$ in., and frequency, $f_1 = 844$ cpm.

What should be the compressor cylinder diameter D_2 and frequency f_2 of a unit with the same shp output $hp_2 = hp_1$, stroke $s_2 = s_1$, and piston length $L_2 = L_1$, but with $\rho_2 = \frac{1}{2}\rho_1$ or 50 per cent piston solidity?

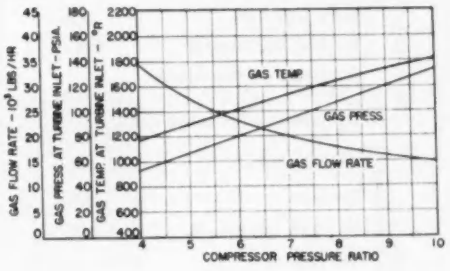

GAS FLOW RATE - 10³ LBS/HR
GAS PRESS AT TURBINE INLET - PSIA
GAS TEMP AT TURBINE INLET - °R
GAS TEMP
GAS PRESS
GAS FLOW RATE
COMPRESSOR PRESSURE RATIO

Fig. 3—Gas generator output as a function of compressor pressure ratio for a 1000 turbine-shp plant

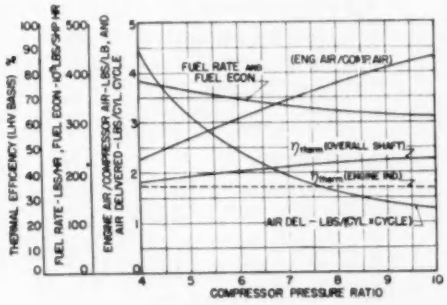

THERMAL EFFICIENCY (LHV BASIS) %
FUEL RATE - LBS/HR., FUEL ECON - 10³LBS/SHP HR
ENGINE AIR /COMPRESSOR AIR - LBS/LB. AND AIR DELIVERED - LBS/CYL. CYCLE
FUEL RATE AND FUEL ECON.
(ENG AIR/COMP AIR)
η therm (OVERALL SHAFT)
η therm (ENGINE IND.)
AIR DEL - LBS/CYL =CYCLE)
COMPRESSOR PRESSURE RATIO

Fig. 4—Gas generator-turbine plant thermodynamic characteristics as a function of compressor pressure ratio for a 1000 turbine-shp plant

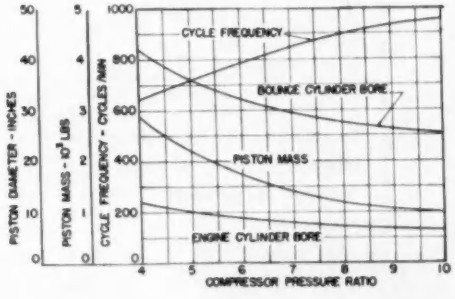


Fig. 5—Gas generator-dynamic characteristics as a function of compressor pressure ratio for a 1000 turbine-shp plant

Table 3

Summary of the Pescara Unit Design and Performance Data.

Gas Turbine		Power output, shp	1138
		Gas flow rate, lbs per hr	29000
		Gas pressure at turbine inlet, psi abs	64.5
		Gas temperature at turbine inlet Fabs	1405
GAS GENERATOR	Operating Conditions Compressor	Pressure ratio	4.85
		Stroke, in.	17.50
		Volumetric efficiency, %	60.8*
		Clearance, %	13.6*
	Engine	Compression Ratio	8.5
		"Effective" stroke, in.	9.7
		Air-fuel ratio	32
	Bounce Cyl.	Pressure level, psi abs	14.7**
		Temperature level, F abs	600**
		Stroke, in.	17.50
	Geometrical Data Engine	Length of piston assembly, in.	49
		Piston area, sq ft	0.979
		Piston length, in.	38
		Cylinder bore, in.	13.4
	Bounce Cyl.	"Effective" piston area, sq ft	6.77
		Piston length, in.	11
		Cylinder bore, in.	35.4
	Comp.	"Effective" piston area, sq ft	5.73
		Ratio of compr. piston area to eng. piston area	5.86
		"Silhouette" piston volume, cu ft	9.36
	Dyn. Data	Piston average bulk solidity, %	45*
		Piston mass, lb.	2080*
		Cycle frequency, cpm	613
	Thermodynamic Data	Air delivered per compressor cylinder per cycle, lb	0.388*
		Ratio of engine air to compr. air	0.516*
		Friction work, % of compr. work	12
		Heat transferred to cooling water ***	19.4
		Engine indicated efficiency (LHV basis), %	29.8
Gas Generator-Turbine System		Fuel flow rate, lb. per hr	460
		Economy, lb per shp hr	0.404
		Thermal efficiency (LHV basis), %	34.6

* Determined by the analysis. ** Assumed.
*** Per cent of chemical energy supplied with fuel.

With the use of affinity relations the answer to this question can be found a follows: Since $s_2L_2 = s_1L_1$, $f_2\sqrt{\rho_2} = f_1\sqrt{\rho_1}$ and $f_2 = f_1\,(\sqrt{\rho_1/\rho_2}) = 1195$ cpm and since $hp_2 \div \sqrt{s_2/L_2} = hp_1 \div \sqrt{s_1/L_1}$, $D_2^2 \div \sqrt{\rho_2} = D_1^2 \div \sqrt{\rho_1}$, and $D_2 = D_1\,(\sqrt[4]{\rho_2} \div \sqrt[4]{\rho_1}) = 25.3$ in. This calculation, therefcre, illustrates the advantages of designing with low mass pistons.

Influence of Idealization on the Design

Applicability of the analysis depends on the validity of the idealizations with respect to both their character and magnitude. For the design of the free-piston generator the most important idealizations are, valve pressure drops, friction losses, and details of the indicated engine cycle.

As far as the first two items are concerned, a large error in their magnitudes has only a small effect on the geometry of the piston assembly. A misjudgment of either valve pressure drops or friction losses by 100 per cent results in the uncertainty of the predicted engine cylinder bore in the order of seven per cent and the compressor bore in the order of only three per cent. Furthermore, an error in the assumed friction, which is more difficult to predict, has a much smaller influence on piston size than an error in valve pressure drops.

However, with respect to the idealization for the indicated engine cycle, it was concluded that the design geometry is quite sensitive to assumptions for maximum temperature at the inner-dead-center piston position and the polytropic exponent accepted for the power stroke. Consequently it was necessary to develop the relationship between these parameters, air fuel ratio, and per cent heat transfer to the coolant.

Influence of Independent Variables on the Design

Independent variables of the design are concerned with the operating conditions at which the designer wishes the gas generator to work. Of these the most important are compressor pressure ratio, engine volumetric compression ratio, air-fuel ratio, and bounce cylinder pressure level.

As an example of the results of the study of the influence of these parameters on the design, Figs. 3, 4, and 5 are presented. They illustrate the influence of compressor pressure ratio on the gas-generator output, gas-generator-turbine plant thermodynamic characteristics, and piston geometrical and dynamical characteristics respectively. All these results refer to a constant engine volumetric compression ratio of nine to one, and constant system power output of 1000 shp. System efficiency, bulk size and weight are all improved with higher compressor pressure ratio. This suggests the trend for future developments of free-piston generators, but there are important limitations imposed by the well known difficulties of cylinder lubrication and piston cooling associated with the operation of highly supercharged Diesel engines.

(*Turn to page 76, please*)

• PRODUCTION • NEW EQUIPMENT • PLANT •

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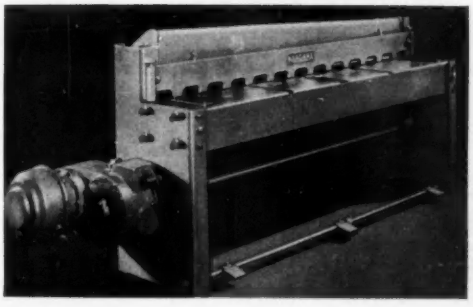


Niagara power squaring shears, in new Series One line

M-1—Power Squaring Shears

New line of Series One power squaring shears produced by Niagara Machine & Tool Works, Buffalo, N. Y., are especially designed for the small sheet metal shop and the heating and air conditining contractor. Fabricated completely from formed steel plates, the new shears are massive and built low-to-the-floor. They cut 6 ft lengths of 14 gage sheet metal at 85 cuts per min. Cutting lengths of 3 ft, 4 ft and 5 ft are also available.

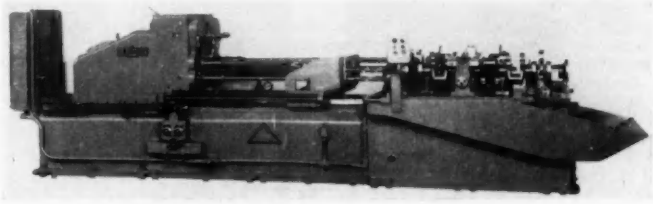
Four cutting edge knives are used in place of single cutting edge knives, eliminating down time for regrinding the dull knife. By simply rotating the knife to a new cutting edge, four times as much use between regrinds is said to result.

Convenient gaging is assured by the front gages, side squaring gages and by a precision ball bearing self-measuring back gage which can be indexed at 1/28 in. increments. An electric foot switch can be furnished for remote control, which permits tripping the shear from any convenient location when trimming long sheets or wide sheets which extend the full length of the bed.

The same Niagara multiple jaw sleeve clutch used on the larger Niagara shears as well as on Niagara presses has been incorporated in these machines to provide instant engagement and positive drive. No heat is generated and there are no friction members to wear. The clutch cannot click or pound because a new anti-friction detent brings the crosshead to a dead stop at the exact correct position after each stroke of the shear.

A new Hi-Power drive provides a completely enclosed transmission in which all mechanisms including clutch, gearing, flywheel and detent operate continuously in a bath of oil. The entire drive and main shaft operate on anti-friction bearings.

In developing the closed steel box sections of the bed and crosshead which support the knives, stress analysis is said to have proved that no other section or material can resist so efficiently —with minimum deflection—the horizontal, vertical and diagonal or torsional loads to which every shear is subjected.



LeMaire horizontal one-way 6-spindle drilling and reaming machine

M-2—Drilling and Reaming Machine

Furnished recently by LeMaire Tool Mfg. Co., Dearborn, Mich., to a prominent motor manufacturer is a horizontal one-way 6-spindle drilling and reaming machine with two workholding fixtures. The difficult operation required of it was the drilling and reaming of lightening holes in 6 crank throws on a 60 in. long 12-cyl aircooled engine crankshaft.

The machine consists of LeMaire No. 20 H. S. hydraulic feed unit having 60 in. of feed. A tool support mounted on the ways moves with the head and supports the tools between the head and the drill guide bushings.

Because of the size of the holes (1⅝ in.) which were drilled from the solid in very tough steel, drills were of unequal length and the load was divided by first drilling through No. 1 and No. 2 crank throws with No. 1 and No. 2 spindles; through No. 3 crank throw with No. 3 spindle, through No. 4 and No. 5 crank throws with No. 2 and No. 3 spindles, and finally through No. 6 crank throw with No. 1 spindle. After drilling the crankshaft was transferred to the reaming fixture and reaming operations were handled with three spindles in the same manner as drilling. Two parts are operated on at the same time, one being drilled and one being reamed.

After the parts have been loaded and clamped in place the machine goes through the entire cycle automatically, feeds being controlled by cams mounted on the cam rail. The entire rail is adjustable to compensate for tool wear.

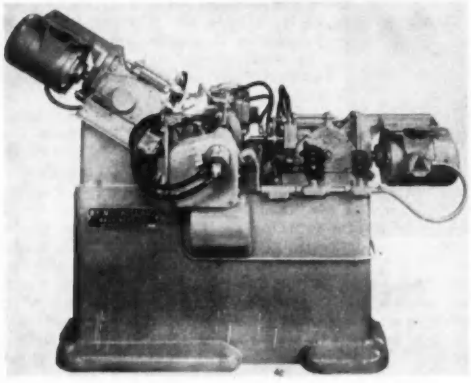
Close-up of LeMaire fixture with crankshaft in place

The three drilling spindles are arranged to feed coolant through oil tube drills, and reaming spindles have coolant flooded on the tools. Coolant tank is in the fixture base.

Production is about 3 drilled and reamed pieces per hr.

M-3—Automatic Index Machine

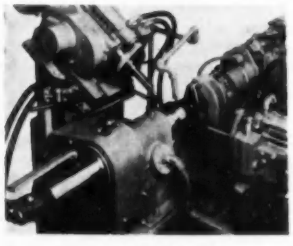
Recently built No. 2 automatic index machine offered by the W. K. Millholland Co., Indianapolis, Ind., drills, reams, taps, counterbores, chamfers or spot faces accurately and to depth.



Millholland No. 2 automatic index machine

The machine incorporates three No. 2 Millholland automatic units of standard self-contained type with 1½ hp capacity and 2½ in. stroke. Two of the Millholland automatic units are mounted horizontally at right angles while the 3rd unit is on an angle around the work.

On the operation shown, a series of



Closeup of No. 2 Millholland automatic index machine

12 holes is drilled around the periphery of a flanged bushing and 24 holes in the flange end. The part is held in an air operated collet chuck mounted on an automatic indexing spindle. Ths unit for drilling 24 holes is equipped with a 4-spindle multiple head while the two other units at right angles are equipped with single spindles. The fixture spindle indexes 6 divisions automatically and stops ready for loading, production on this operation being 150 to 320 pieces per hr.

The machine is arranged for continuous or intermittent operation by push-button control, and the operator is required only to load and unload the fixture.

M-4—Electron Drilling Machine

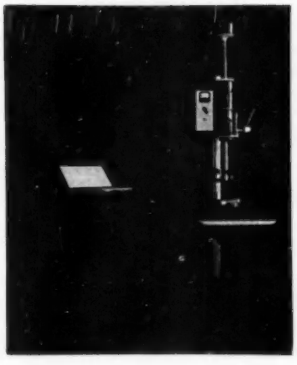
A new electron drill, developed by the Elox Corp. of Michigan, is claimed to approach or equal the speed of twist drilling. This motor driven automatic hard metal drilling machine, employing a new electronic principle of operation, uses only 1/5th of the usual power, and increases the speed of cutting hardened steels as much as 15 times above previous Elox models.

The electron drill was originally designed for production cutting of extremely small as well as large holes in hardened metals and for production removal of taps, drills and reamers in a wide variety of sizes. On production drilling or salvage, performances can be duplicated exactly on each piece in regard to speed of cutting and type of hole required. Drilling is a continuous process for the full length of electrode used.

The electron drill is entirely automatic. It also can be hand fed by the operation of a simple switch, and will chuck up 36 in. of electrode. It is reported extremely reliable and sensitive, giving perfect control as well as fast speeds on standard electrodes from 0.040 in. to 0.750 in. and larger. The electron drill is said to require no more knowledge to operate than a drill press and cannot be damaged by operator abuse.

The drill will not affect or damage the material being worked on, i.e., annealing or hardening the work piece. There is no sticking or welding. No resetting of the machine is required during the drilling operation. Electron drill holes can be reamed to exact size without grinding or other preparation.

Without modification, the electron drill will drill carboloy, nickel and cobalt steels, nickel and chrome steels,



Elox automatic electron drilling machine for hard metals

manganese steels, stellite, cast iron, copper and copper alloys, aluminum, Alnico, lead, zinc and many others.

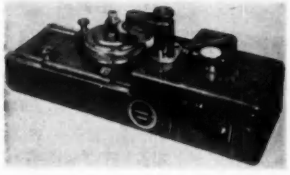
M-5—Rolling Fixture For Gear Assemblies

The new Red Ring rolling fixture announced by National Broach & Machine Co., Detroit, Mich., facilitates loading and unloading the work gear and enables larger and more complicated assemblies to be checked. Gear rolling immediately indicates any errors in both size and eccentricity and also serves as a check on excessive tooth roughness.

For additional information please use coupon on page 60

Illustration below shows the low sun gear and clutch assembly for an automatic transmission being inspected. The work part is held in a pot chuck, with a C-washer and thumb nut to itghten it down. It is carried on the adjustable head at the left end of the fixture—adjustable for gears of varying diam.

The master gear, used to check the sun gear, is held by the swinging head mounted on a precision ball slide carriage shown at the right. When the carriage is retracted by the hand lever, the swinging head may be lifted up and



National Broach Red Ring rolling fixture

swung clear of the work gear for easy loading and unloading. This feature accommodates gears of larger diam than could be easily handled on previous gear rolling fixtures.

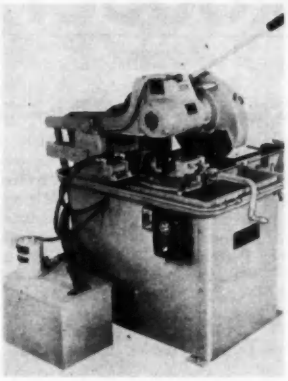
Inspection is made by advancing the carriage to bring master and work gears into mesh. The gears are held in contact by constant predetermined spring pressure and rolled together. The errors previously mentioned are registered on the dial indicator just behind the swinging head.

M-6—Metal Cut-Off Machine

Now ready for immediate shipment, a new model "swing-cut" metal cut-off machine produced by Stone Machinery Co., Inc., Manlius, N. Y., is fully equipped for wet cutting including recirculating pump, tank, hose connections and removable splash guards. The flow of cutting fluid is controlled by the action of the cutting head.

A new and improved method of adjusting depth of cut has been added in the form of a wheel depth control arm operated from the operator's normal position. Also added is an adjustable work stop which can be used for cutting of multiple pieces up to 24 in. in length. The splash guards are movable for proper protection when cutting at angles.

This machine can also be equipped



Stone "swing-cut" metal cut-off machine

with an air activated self-centering vise either hand or foot controlled.

M-7—All-Hydraulic Press

This 425 ton self-contained, all-hydraulic press built by the Hydraulic Press Mfg. Co., Mount Gilead, Ohio, for the International Harvester Co. for deep drawing and forming of tractor and other farm machinery parts, is single action type with a 133 ton die cushion installed in the bed. Press has a 24 in. stroke and a pressing surface of 60 in. by 48 in. It is operated by the H-P-M closed circuit system which provides a fast cycle, constant drawing speed, smooth operation, shockless reversal and full protection from overload. Because of the ample clearance on the press bed, dies can be changed quickly—advantageous for short runs on a mass production basis

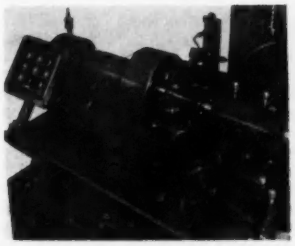
M-8—Fillet Rolling Equipment

A. P. Schraner & Co., Cleveland, Ohio, has made available a process for rolling fillets on front wheel spindles, which is based on a development by General Motors Corp. Tests on various designs of spindles, made with the cooperation of several of the automobile manufacturers, are said to have established the fact that the rolling operation materially increases the fatigue point of these parts.

The machine on which the process is performed is double station, fully hydraulic, with push button control and electric timing device, which allows the operator to load one station while the other is working. Production rate is 120 pieces per hr. Hydraulic pressures and electric timing device can be adjusted to suit.

The process brings a pair of rollers, oppositely mounted, against the fillets at 45 deg angles, with pressures at the work varying from 300 to 1200 lb. The work is then rotated at approximately 150 rpm for about 20 seconds, or, what ever time is necessary.

Most important factor is the special type of rollers used. The roller blanks are formed from high speed or carbide steel, and vary in size from approxi-



Close-up of Schraner equipment for rolling fillets on front wheel spindles

mately 2 in. in diam by ⅝ in. thickness, to larger sizes.

Outer edges of the rollers are formed with 45 deg angles which meet at the extreme roller periphery. The roller is then mounted at a slight offset and a flat is ground around the periphery which generates a narrow surface at the point of the periphery which is less distant from the axis of the offset and a wider surface at the opposite point. The intervening periphery tapers from the narrow point to the wide point (180 deg), and then back to the narrow point. The two edges of the periphery are then ground and polished to suit the radius of fillet to be rolled.

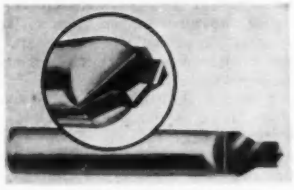
This type of roller allows the narrow periphery to roll at the bottom of the fillet and, as the work rotates, the constantly changing width of the roller

(*Turn to page 62, please*)

NEW PRODUCTS

For additional information regarding any of these items, please use coupon on page 60

P-1—Center Drill

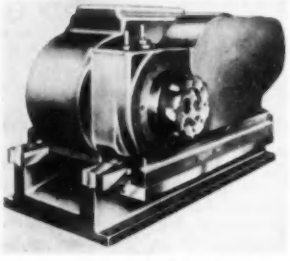


New center drill for hardened steel put out by National Tool Salvage Co., Detroit, Mich., drills new centers on tools that have been ground off or on which centers are worn.

P-2—Production Milling Head

Now being manufactured by the Motch & Merryweather Machinery Co., Cleveland, Ohio, a new production milling head provides all gears integral or mounted solidly by taper and key to lock them in place on the shafts. Adjustment of the steel quill up to 2 in. for cutter wear is obtained by an Acme thread, and the movement gaged by a micrometer dial. A flywheel effect is obtained by a large, heavy spindle gear mounted solidly on the spindle. Lubrication inside the head to all bearings and gears is positive by a geared pump. Automatic lubrication is provided for the hardened steel ways.

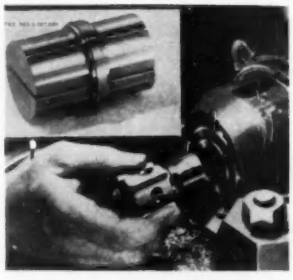
Although this milling head is arranged with a single speed for production work using either high speed steel or tungsten carbide-tipped cutters, change gears can be provided. The new milling head is claimed to provide the necessary rigidity and horsepower at the tool point to give especially excellent results with carbide tools. The new head can be adapted by the manufacturer to special production milling machines that can also provide for other simultaneous machining operations.



Motch & Merryweather production milling head, M-30

P-3—Expanding Arbor Type Tool

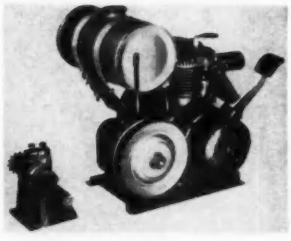
The Asco Corp. of Cleveland, Ohio, is bringing out a new range of sizes for the Asco Auto-Arb, designated as Type B. Auto-Arb, a production tool of the expanding arbor type designed for holding work pieces by the inside diam while machining, counter-boring, chamfering or finishing the outside surface, permits chucking and unchucking the work without stopping the spindle, thereby requiring no tools for this operation. Said to work equally well in blind holes, it eliminates need for specially-built arbors for difficult jobs. It has been used for machining wood, plastics and other materials as well as metal, and for coil winding applications. Drill press and milling machines equipped with collet devices will speed production and handle a much wider range of work with an Auto-Arb, the company declares.



Asco expanding arbor type production tool, the Auto-Arb

The original Type A series was designed to accommodate work with inside diam ranging from ⅜ in. to 1½ in. on five sizes of collets—the collet size determining the maximum work size. The new Type B series accommodates work with inside diam from 33/64 in. to 1 in. on a machine with ½ in. collet, and from 1 1/64 in. to 1½ in. with a 1 in. collet.

P-4—Transmission With Automatic Clutch



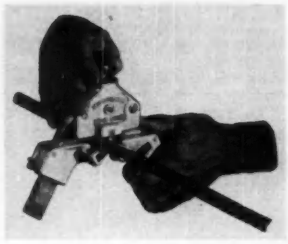
Cushman Varimatic transmission

Designed by Cushman Motor Works, Inc., Lincoln, Neb., for use on Cushman "Husky" 3.0-4.5 and 5.2 hp air-cooled engines, a new Varimatic transmission provides, through use of an automatic clutch, a smooth throttle controlled speed change varying between a 3:1 reduction in low to a .95:1 overdrive in high. The transmission consists of two main units. The drive member, which includes the clutch mounted on the engine crankshaft, is connected with a V belt drive to the driven member which is mounted on a jackshaft or on a sliding gear transmission for an additional low speed of 2.25:1 and reverse. The two units are balanced to function together with the belt tension controlled by the action of springs on a cam surface in the driven member. This power unit is suitable for use in material handling equipment and in other vehicles.

P-5—General Purpose Honing Tool

The Micromatic Hone Corp., Detroit, Mich., is producing a new wide range, general purpose tool for honing external surfaces. The tool is called the Odee-Hone. With it, no special machine or skill is required to produce accurate, highly finished surfaces on all types of cylindrical parts such as shafts, spindles, guide pins and bars, piston and piston rods, valve spools and plug gages. The tool requires no aligning, fixturing or wheel dressing.

One tool hones any parts from ½ in. to 2½ in. in diam regardless of length



Micromatic Hone Corp. new general purpose tool, the Odee-Hone

or material. It may be used with any lathe, drill press or electric drill. High tolerances can be held. Diametric size is easily held to 0.0001 in. or less, by means of a calibrated "feed" dial that gives absolute control of the in-feed of the abrasive. All out-of-roundness, waviness and chatter left by previous machining operation is declared to be removed as a geometrically accurate cylinder is generated.

This Odee-Hone has no springs, screws or hinges to wear out or break; is light enough to be easily carried and handled; gives all the advantages of centerless grinding without chatter or work piece length limitation. Stock removal capabilities of this tool are in some cases comparable to those of a grinding operation, states the company. On long, small diameter parts the capabilities of the grinding machine are even surpassed because the abrading faces are self-reactive and do not tend to spring the work piece, it is pointed out. Parts that are only a few "tenths" oversize can be Odee-honed to size in less time, it is said, than is required to re-center and indicate the part and dress the wheel of a grinding machine.

P-6—Taper-Checking Fixture

For simplifying the inspection of tapers the new Taper-Chek fixture offered by Webber Gage Co., Cleveland, Ohio, eliminates long, tedious set-ups.

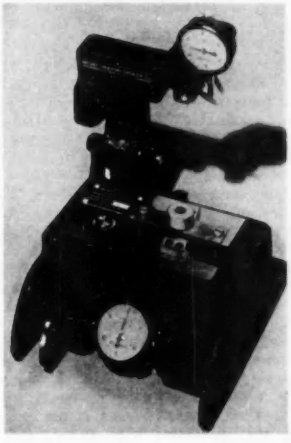
Webber Taper-Chek fixture

Instead of using comparator, sine bar or spaced roll, the operator assembles the proper combination of angle blocks. The blocks are then mounted with the work on the Taper-Chek and an indicator reading is taken. In less than two minutes the taper is said to be checked to an accuracy within 0.000020 in. in 4 in.

The fixture is designed only for use with Webber angle blocks and cannot be used with sine bar. It consists of base and three V blocks capable of holding and measuring any standard taper up to No. 50 milling machine taper, plus any special taper in that size range.

Taper-Chek eliminates cross checking, and comparing and reconciling differences that sometimes arise with conventional methods, the company says. It gives the same answer wherever used, by direct reading on the angle blocks. Errors in the use of the sine bar tables and to variations in method are claimed eliminated with this true standard in measuring tapers. Since with no calculations, no sine bars, and no knife edge there is no chance of error due to compounding of angle.

P-7—Thread Checking Gage

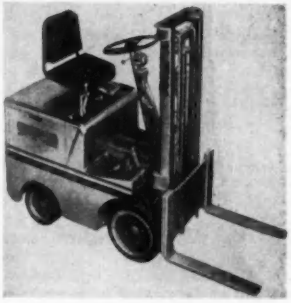


To reduce inspection time and increase accuracy of checking threaded parts the newly designed No. 11 gage placed on the market by Bryant Chucking Grinder Co., Springfield, Vt., uses interchangeable segments so that a wide range of internally or externally threaded parts can be checked on the same basic gage. Internally threaded parts can be checked for fit and inspected for roundness in one operation at the rate of 0.07 min. Operator fatigue is low because only the part is handled. One set of segments checks up to 100,000 parts. A new gage attachment checks face run-out in relation to the thread axis.

P-8—Electric Fork Lift Truck

A new electric battery-powered "Trucloader," 1000-lb fork-lift truck brought out by Clark Equipment Co., Battle Creek, Mich., features use of a separate motor to provide power for the hydraulic pump which results in an 80 per cent increase in lifting and tilting speeds over the former model. The lift-control lever is of new design, to permit foolproof identification and to operate in the same direction as the action desired—a pull straight up raises the forks; a push down lowers the forks. Similarly, the drive motor functions with greatly increased efficiency because it has nothing to do with the hydraulic system.

Uprights of rolled alloy steel, proved satisfactory on Clarks' larger models,



Clark 1000-lb electric fork lift truck, "Trucloader"

provide added strength to the lift assembly. Lift heights are available in a range from the standard of 84 in., with overall height of 61 in., to 130 in. and an overall height of 84 in.

Automatically accelerated control is standard equipment. By this means, power controlled through a master switch, in turn controlled by an automatic timer, provides even acceleration of motor speed. Control is the non-plugging type; direction of travel cannot be changed until the motor comes to a full stop.

"Dead man" brake, operated off the drive shaft of the drive motor, sets automatically whenever the driver's seat is vacated. The directional control lever locks in neutral automatically when the driver leaves his seat. Load capacity has been increased with 24 in. load-center rating. Speed is 30 per cent higher.

Steering mechanism is of new design for use with the pivoted type steering axle. Kickback is stated to be entirely eliminated.

(*Turn to page 67, please*)

NEW PRODUCTS for AIRCRAFT

FOR ADDITIONAL INFORMATION regarding any of these items, please use coupon on PAGE 60

U-1—Triple Action Hydraulic Press

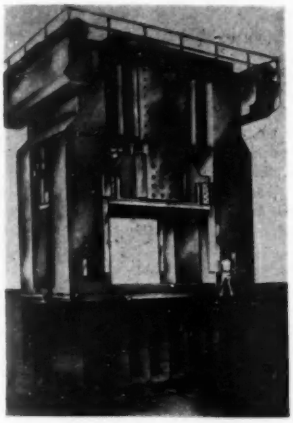
A giant 8000 ton triple action hydraulic press, claimed to be the largest metal-drawing press in the world, is now being built by the Birdsboro Steel Foundry and Machine Co., Birdsboro, Pa., for the Lockheed Aircraft Corp., Burbank, Calif.

Dimensions of the die space area will be 30 ft 4 in. from left to right and 10 ft from front to back. Bed and crown will be of single-piece all-welded construction; tie rods and main cylinders will be forgings; and the rest of the press will be made of steel castings. Base and crown each weigh 150 tons, while one slide assembly will tip the scales at 185 tons. Length of the forming stroke will be 5½ ft and working space inside press when slides are raised will be 7 ft. It will have a 5000-ton draw plus 3000-ton blankholder pressure, with a cushion pressure of 2000 tons.

With it, sheets of high strength, light weight aluminum alloys and stainless steel, notoriously hard to work, can be fabricated in larger sizes and many of the costly and time-consuming riveting operations in aircraft construction can be eliminated. For example, jet transports of the future will require larger external wing tanks.

Also, certain "shaped" parts like heavy skin panels and beams, "drawn" parts like drop tank shells, and certain "compression formed" parts like fuselage and wing leading edge sections are at present beyond industry facilities in large area sizes. The new press will make it possible to handle all types of alloys in all gauges and sections now contemplated in engineering and design trends. Even the new 120 in. wide aluminum sheet can be pressed in the new machine. The press can be used both for forming work requiring mating dies or stretch forming and for rubber pad work. It will also perform such operations as drawing, blanking, coining, piercing, and trimming.

The press is expected to be a vital part in Lockheed's program of experimenting with and testing new manufacturing methods. It may, for instance, be possible to die-form integrally stiffened skin surfaces and avoid the long and expensive milling process. Thus, the press may prove to be an important factor in the development of new aircraft and jet transports, or even guided missiles requiring heavy and large materials.



Artist sketch of Birdsboro immense 8,000 ton triple action hydraulic press

A feature of the king-size machine is its extreme flexibility. It is said to be the first press of its size to be made with flexible cycle controls so that it may be used for a variety of operations. It has been designed to change sequence of operations from single action to double action, to change speed, and to change pressure—all with push-button control. It also has been designed to facilitate removal of parts difficult to run and remove from the dies.

The press is powered by one 75 hp and two 250 hp motors. It can be run by one man, or from four stations, since a set of operation controls will be installed on each corner of the press to permit operation with the greatest margin of safety.

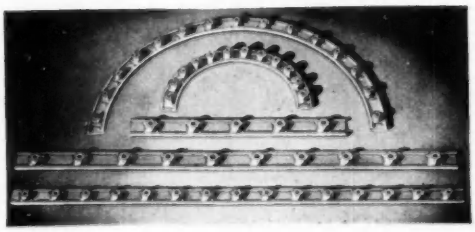
Here's how it works. A flat sheet of aluminum is placed on the bed of the press. At touch of a button, a portion of the press moves down and clamps the edge of the sheet to the bed, with a force of 3000 tons, if necessary.

Moving down inside the first one, a second slide descends, carrying a die formed according to the shape of the part desired. Exerting up to 5000 tons pressure, the press forces the die against the flat sheet, shoving it down towards the bottom of the press. The first slide holds the edge of the sheet, and the second forces it to take the contour of the die. If further forming is needed, as perhaps on the bottom of the part, another slide, capable of 2000 tons pressure, rises from he bottom of the press, and carries with it a die for impressing the bottom of the part. The three slides then return to their original positions, the part is removed from the press, and the excess metal is trimmed from its edge. The part is then ready for installation or for further machining, depending on its function.

U-2—Gang Channel Nut Strip

A new ESNA gang channel nut strip, to provide permanent fasteners for applications subject to repeated "on-off" usage, has been introduced by Elastic Stop Nut Corp. of America, Union, N. J.

Blue anodized for easy identification, the channel strip is made of high strength 24S-T4 aluminum alloy. This extra tough alloy provides additional strength for unusual assemblies in such applications as access covers and panels, especially in aircraft, where mis-alignment of sub-assembly components can result in twisted channel strips, or nuts pushed out. A new method of cut and

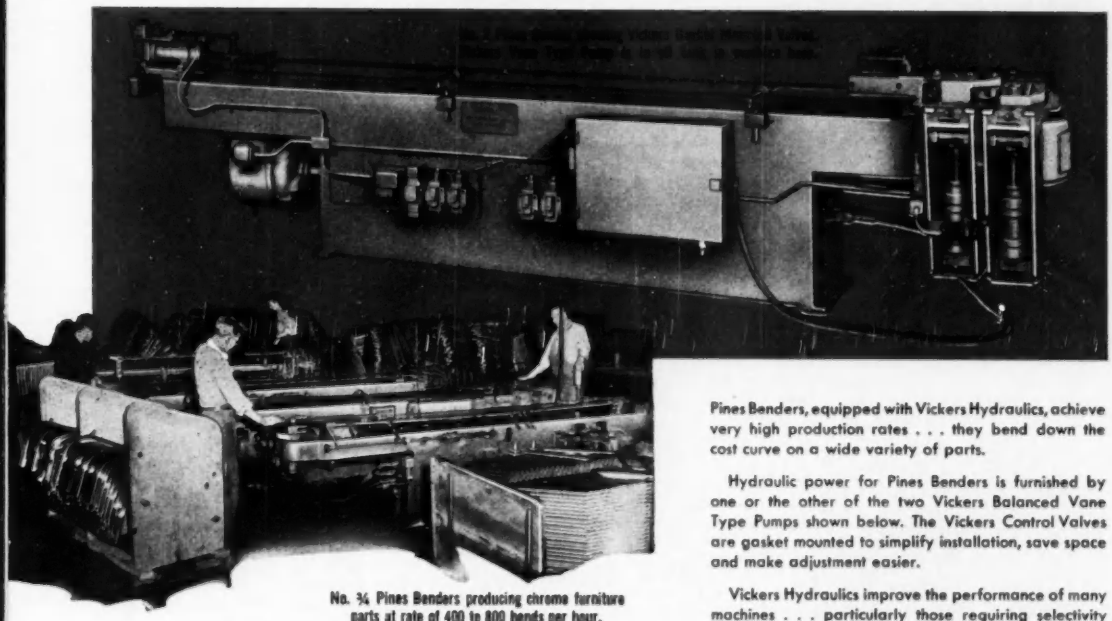


ESNA gang channel nut strip.

Bending the Cost Curve DOWN

PINES BENDERS

Another Cost-Cutting Application of VICKERS HYDRAULICS



No. ¾ Pines Benders producing chrome furniture parts at rate of 400 to 800 bends per hour.

Pines Benders, equipped with Vickers Hydraulics, achieve very high production rates . . . they bend down the cost curve on a wide variety of parts.

Hydraulic power for Pines Benders is furnished by one or the other of the two Vickers Balanced Vane Type Pumps shown below. The Vickers Control Valves are gasket mounted to simplify installation, save space and make adjustment easier.

Vickers Hydraulics improve the performance of many machines . . . particularly those requiring selectivity of control and adjustment to suit type of work. Any sequence of motions can be provided . . . made automatic if desired. Vickers Hydraulic Equipment is easily protected against overload; incorrect or unsafe operation can be prevented by interlocks. Contact the Vickers Application Engineering Office near you for suggestions on how Vickers Hydraulics can improve your machinery. Write for Catalog 4900.

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Smaller Pines Benders use this Vickers Single Stage Vane Type Pump (for 1000 psi continuous operation). Hydraulic balance eliminates bearing loads caused by pressure, assuring longer life.

Larger Pines Benders have this Vickers Two Stage Vane Type Pump (for 2000 psi continuous operation) which has two hydraulically balanced pumping cartridges in one compact housing.

NEW PRODUCTS for AIRCRAFT

For additional information regarding any of these items, please use coupon on page 60

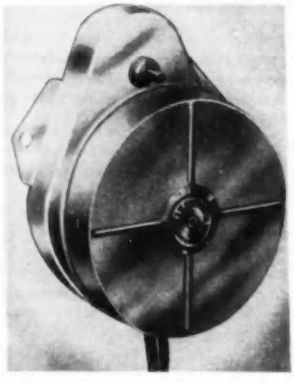
raised dimpling also retains the nuts securely and prevents over-riding.

ESNA has designed the gang channel strip especially to promote additional production line economy and to further simplify time-saving, multi-unit nut installations. The nylon locking insert in each nut is said to assure reuseability for more than 100 applications.

The characteristic ESNA nylon red elastic locking collar of these nuts, said to assure self-locking torque for the life of the aircraft, protects fastenings against vibration, impact, and shock. The collar also keeps bolt and nut threads rust free and seals against liquid seepage.

U-3—Hermetically Sealed Enclosures

Hermetically sealed enclosures now furnished for timers manufactured by the A. W. Haydon Co., Waterbury, Conn., are suited to any application involving corrosive atmospheres or high humidity as encountered in aircraft, ships and mines. For military use, hermetic sealing gives maximum protection against fungus growth, salt spray, oil spray, sand and dust, explosive atmospheres and climatic changes. All enclosures are evacuated to 100 microns and filled to one atmosphere with dry nitrogen so that full switch ratings can be used even at extremely high altitudes where contact capacity is normally reduced. Deterioration of motor brushes is said to be completely eliminated.



Haydon hermetically sealed enclosure for timers

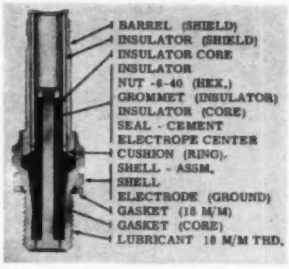
U-4—Temperature Control Rheostat

Designed by Barber-Coleman Co., Rockford, Ill., for aircraft cabin temperature regulation, this new compact rheostat combines control point selection for automatic heater or bypass valves and manual over-ride. Control point for automatic valve operation is set on a graduated dial. In case of automatic control failure, valves of other units can be manually positioned by detent action switches at the ends of the rheostat travel. Rheostat wiper arm resistance is minimized by precious metal contacts. Rheostat setting is maintained by a vibration-proof friction brake. Single or tandem rheostats are available with maximum resistance up to 3000 ohms. Maximum rheostat travel is 180 deg.

Barber-Coleman rheostat

U-5—Annular Electrode Spark Plug

A unique annular electrode spark plug, designed for airplane engines by Hahn Aviation Products, Inc., Phila., Pa., is reported as giving trouble-free operation in recent tests for over 400 hours without cleaning, adjustment or removal from the engine itself. This Hahn Model LS702, in which the center electrode is of an annular shape rather than the conventional wire type, is a long reach shielded aircraft spark plug approved by the Civil Aeronautics Authority for use in commercial airplanes. The center electrode annular construction is said to provide for extreme ease of starting and lack of carbon and lead fouling. The plug requires no adjustment, with wear being evenly distributed around the center core.



Hahn annular electrode spark plug

U-6—Hard Coating For Aluminum

A new hard coating for aluminum, making this light metal eligible for the first time in many high wear-resistance applications heretofore monopolized by steel alloys, has been developed by the Glenn L. Martin Co., Baltimore, Md. In standard tests performed on a Taber abrasion tester, this new hard coating for aluminum, designated "MHC" finish, is said to have evidenced only half as much wear as did cyanide case-hardened steel, after 50,000 cycles. Coatings have been applied to such widely dissimilar items as gears and pinions, surveying instrument parts, turbine impeller blades, hand tools, and the leading edges of high-speed airfoils.

Helicopter rotor blade tips, which must often be revved up in clouds of dust, sand or cinders, represent a noteworthy application for the new hard finish. MHC-processed surfaces also afford a definite margin of heat-insulating protection to the base aluminum, when exposed to transient high temperatures. Numerous direct MHC-finished aluminum substitutions for steel are being made in the case of moving parts for Martin aircraft—as well as for static surfaces that are exposed to severe wear. A variety of units, from pistons, cylinders and jack-screws, which would seize if uncoated, to airplane door thresholds and even the mechanic's wrenches—exemplify weight and cost savings effected through aeronautical uses of MHC.

The Martin hard coating is applied to aluminum and its alloys by an electrochemical process, which creates a non-metallic, highly heat-refractive surface—strongly bonded to the base metal. Coating thicknesses range from 0.002 in. The hardness of the coating may be considered "file hard."

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Publications AVAILABLE

New Industrial Literature listed in this department is obtainable by subscribers through the Editorial Department of AUTOMOTIVE INDUSTRIES. In making requests please be sure to give the NUMBER of the item concerning the publication desired, your name and address, company connection and title.

L-1 Paint Stripping

Oakite Products, Inc.—A new, illustrated, 14-page booklet discusses specific paint-stripping materials and describes four simplified methods of removing paint from surfaces; 1) the hot-flow method; 2) cold-spray method; 3) steam gun method and 4) the tank immersion method. Specialized materials for surface preparation of parts before repainting to promote paint adhesion are also discussed briefly.

L-2 Natural Rubber Booklet

Natural Rubber Bureau—The story of natural rubber, past and present, is given in a new fact booklet available from the Natural Rubber Bureau, 1631 K Street, N.W., Washington 6, D. C. The 64-page booklet outlines the history of natural rubber from its beginning in South America to its present major role in the economy of the Far East. A major section of the booklet is devoted to a pictorial description of the growth of rubber and its preparation for shipment.

L-3 Roughness Measurement

Physicists Research Co.—An illustrated bulletin on the complete line of Profilometer equipment is entitled, "Whatever Your Needs in Roughness Measurement." The new publication lists the range of work—internal and external—covered by each of the standard Profilometer Tracers. The bulletin also lists appropriate piloting of each Tracer, and describes standard piloting equipment. Illustrations show typical shop applications.

L-4 Socket Cap Screws

The Bristol Co.—Bulletin No. 881 covers the recently announced small wire-size multiple-socket cap screws and set screws. The bulletin is well illustrated and gives full information on specifications and prices.

L-5 Automatic Checking Recorder

Michigan Tool Co.—A 2-page techical bulletin describes the new Model MTR Michigan Automatic Checking Recorder. Photographs and text illustrate major features and controls of the recorder. The method of machine setup and operation is also described.

L-6 Solenoid Valves

Skinner Electric Valve Div., The Skinner Chuck Co.—Two new bulletins are available covering the company's product as follows: Bulletin 505 gives complete details on the V-5, M-2 and M-3 Series of Solenoid Valves. Bulletin 501 contains complete data and specifications of the V-5 series.

L-7 Round Punches

Richard Brothers—A 2-page insert, prepared as a supplement to the company's catalog, lists all sizes and prices of the new high-speed steel punches.

L-8 Magnet Wire

General Electric Co.—Complete information on the company's Formex and Deltasbeston magnet wires is available in a new 32-page booklet. The booklet lists both film-type and asbestos and glass-insulated magnet

(*Turn to page 72, please*)

TIME SAVER COUPON

***THIS TIME SAVER COUPON** is for your convenience in obtaining, WITHOUT OBLIGATION, more information on any one or more of the publications described above OR New Production and Plant Equipment OR New Products items described on other pages.*

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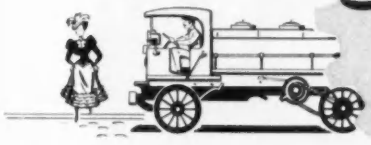
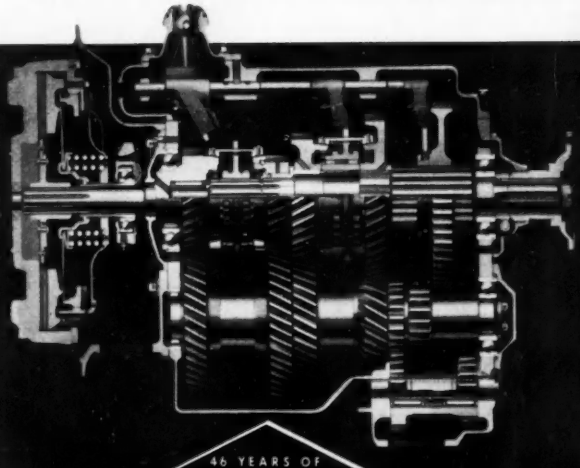


–say operators of

Spicer Fully Synchronized Transmissions



46 YEARS OF Spicer SERVICE

The clashing and smashing of gears is as out of date as solid tires. Engine lugging, missed shifts, and excessive slowdown for shifting belong to the days of the hand crank and acetylene lights.

The Spicer *Fully* Synchronized Transmission has eliminated all these inefficient, clumsy driving operations. It is *fully* synchronized in all four top speeds, permitting quick, clean shifts with the lever travelling the same distance every shift. You get fast getaway – shifts are made without slowdown for double-clutching. Fuel savings and lower vehicle upkeep are assured.

Get out of the button-shoe era – streamline your vehicle operation with the Spicer *Fully* Synchronized Transmission.

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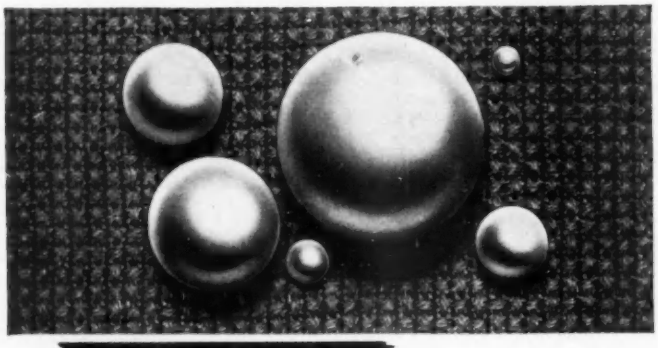
(*Continued from page* 53)
climbs up the sides of the fillet until the wide part of the roller periphery is against the wide part of the fillet, when the action is reversed to the starting point. This action not only rolls but actually irons out the fillet surface. The rollers are constantly held against the work by hydraulic pressure. By arranging the proper differential between the diam of the work to be rolled and the diam of the rollers used, each point on the roller surface, in one 20 second cycle, contacts each point of the fillet, thus insuring complete and uniform rolling of the entire fillet surface.

a metal ball PROBLEM?



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Whether it is a precision ball bearing or one of the other many ball applications in industry, your problem will not be entirely new. Strom has been in on many ball problems and knows the importance of the right ball for the job.

Strom has been making precision metal balls for over 25 years for all industry and can be a big help to you in selecting the right ball for any of your requirements. In size and spherical accuracy, perfection of surface, uniformity, and dependable physical quality, there's not a better ball made.

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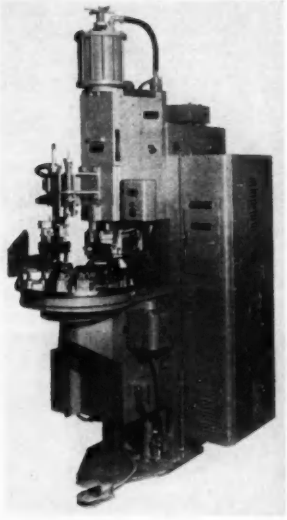
M-9—Resistance Projection Welder

Resistance projection welder of the Taylor-Winfield Corp., Warren, Ohio, is complete with motor driven geneva indexing table, electrical controls and automatic air operated pick-off work ejector. With no current carrying bearings, it is a dual ram type welder with five stations and ten dies, welding two assemblies simultaneously.

This machine projection welds a mounting plate of 16 gage low carbon steel to a telephone part box of 18 gage low carbon steel. The box contains electrical parts and is considered disposable in case of breakdown. This makes important the increased production of approximately 1600 assemblies per hr as against 400 assemblies per hr on a standard projection welder.

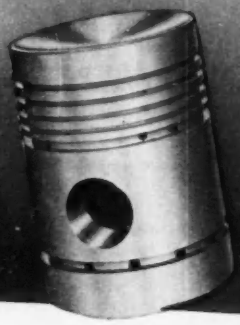


Taylor-Winfield resistance projection welder, dial feed type

M-10—Power Elevating Attachment

A power elevating attachment for all J&L pedestal type optical comparators —new or in the field—is offered by Jones & Lamson Machine Co., Springfield, Vt. Having a simple motor-drive unit for raising or lowering the work table, this inspection aid is at least 50 per cent faster than manual position-

Air Craft



Diesel

Wing Insert

Every Type Aluminum Piston ... *One* Standard of Quality

STERLING

Leaders in Aluminum Pistons for 30 Years

Sterling Engineers will work with you as they have with other leading manufacturers in developing pistons to meet your exacting requirements. Wire or phone.

Two Cycle

Steel Truss

Turbulator head

T-Slot

Trunk Type

STERLING ALUMINUM PRODUCTS INC.

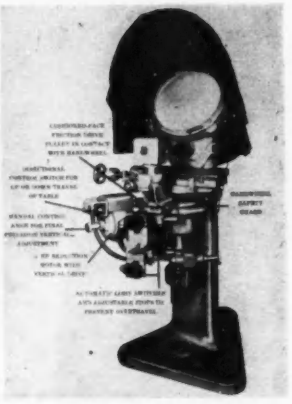
ST. LOUIS, MO.

• PRODUCTION • NEW EQUIPMENT • PLANT •

For additional information regarding any of these items, please use coupon on page 60

ing of the table with the handwheel.

A single finger-touch switch lever gives the operator control of the rapid-acting vertical traverse. The operator does not touch the handwheel—in fact the unit includes a guard to keep his hands away. Nor does he worry about overtravel, because electrical limit switches automatically cut off power at the extreme up or down positions. Extremely delicate final adjustments are obtained manually by turning a knurled knob mounted on the motor shart directly below the control lever. The unit,



Jones & Lamson power elevating attachment

is declared almost indispensable in inspection and production departments where set-ups are constantly being changed and table positions shifted for each successive job.

M-11—Turret Punch Press

Put on the market by Wiedemann Machine Co., Phila., Pa., a RA-41P turret punch press for high speed piercing of electrical panels, switchboards, etc., combines the pantograph for rapid hole location with the turret for quick access to punches and dies.

The turret of the machine carries 16 to 20 different punches and dies up to 3 in. diam—round, square, shaped, or group. A handwheel rotates the turret to place any punch and die in piercing position in 2 seconds. Work to be pierced is clamped to the cross slide in proper relation to a template in which ¼ in. diam holes have been accurately located to correspond with the center of each hole to be pierced in the material. By a simple coding arrangement, all template holes representing the same size punch can be connected by a colored paint line to form a visual "chain" for the operator to follow with the stylus. The free-moving stylus is guided by the operator from hole to hole in the template, which accurately positions the material under the ram. The press is automatically tripped, but only after the stylus point has positively engaged the template hole.

The RA-41P press handles sheets up to 28 in. by 40 in. Its capacity is 15 tons pressure, with an 11/16 in. stroke of the ram which operates at 175 strokes per min, powered by one hp-3450 rpm motor.

Mechanical Tappets
Hydraulic Tappets
Oil Pump to Distributor Shafts
Rocker Arm Shafts
Water Pump Shafts
Flywheel to Crankshaft Screws
Adjusting Screws
Cylinder Head Cap Screws
Main Bearing Cap Screws
Differential Carrier Screws
Cylinder Head Studs
Main Bearing Studs
Wheel Bolts and Studs
Push Rods
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Special Screw Machine Parts 1/16" to 5" Diameter, Plain or hardened and ground ● Cap Screws ● Set Screws ● Nuts ● Studs ● Taper Pins ● Socket Screw Products ●

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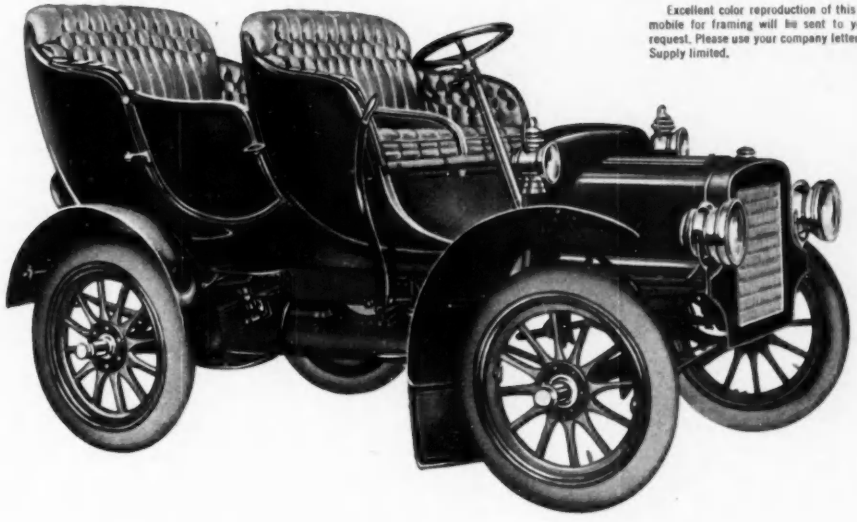
2701 WASHINGTON BLVD.
BELLWOOD, ILL.
Established 1872

THIRD OF A SERIES of old-car paintings is this bright 1906 Cadillac Model "M", which sold for $950. Lamps, top and windshield were listed as extra. Her one-cylinder, 10 h.p. engine was capable of driving her 1350 pounds at speeds up to 30 miles per hour, without a tailwind. A 1905 Cadillac of the same general specifications made the trip from Toledo to Cleveland and return, a distance of 244 miles, in 11 hours; consumed 14 gallons of gasoline.

Excellent color reproduction of this automobile for framing will be sent to you on request. Please use your company letterhead. Supply limited.



She traveled far but her colors faded fast

VICTORIAN curves softly blended with subtle colors of carmine and deep purple to form a carriage fit for a queen. Your 1906 Cadillac was beautiful indeed, and the remarkable performance of her simple one-cylinder motor modestly foretold her brilliant future. Far from brilliant, however, was the performance of her 1906 body finish which, in spite of twenty or more finishing coats, was unable to withstand the effects of the weather.

Color varnishes then available were inadequate; scientifically processed car finishes were yet to come. Thus, it was no great surprise that her colors faded and blushed in the hot summer sun, often paled in a matter of weeks.

By contrast, today's lustrous lacquers rival the rich colors of nature in all their depth and beauty; yet faithfully reflect, in every kind of weather, the enduring qualities of America's finest cars.

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"Proudly the automotive world displays the lustrous beauty of R-M Lacquers"

America's leading manufacturer of fine lacquers, enamels and undercoats for automobiles, trucks, farm equipment, appliances, and numerous other products of industry. We invite your inquiry.

R-M

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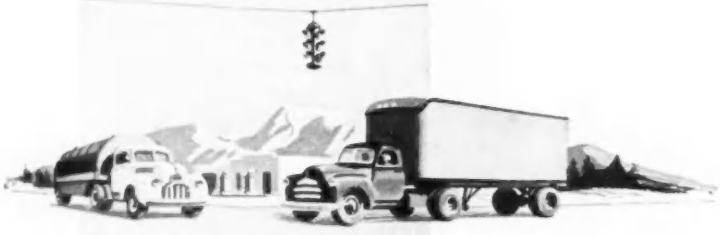

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Zenith

is the Engineers' Choice!

Just take a ride in a Zenith powered truck—and you'll know why Zenith is the engineers' choice for heavy-duty carburetion. You'll experience Zenith's smooth, fast acceleration, strong idling and freedom from stalling, its obedient response to your demands for power and speed. Then a look at the records will show that Zenith's unequalled performance *really lasts*—giving dependable and trouble-free operation year after year. For better carburetion in *your* heavy-duty equipment, insist on Zenith—the choice of experienced engineers for quality performance.

ZENITH CARBURETOR DIVISION OF
696 Hart Avenue • Detroit 14, Michigan

Bendix
AVIATION CORPORATION

Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, N. Y.

NEW PRODUCTS

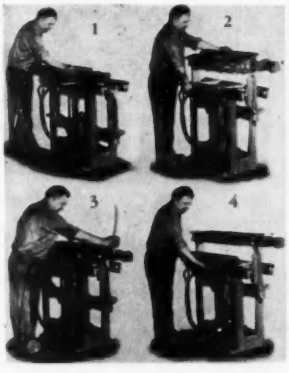
For additional information regarding any of these items, please use coupon on page 60

(*Continued from page* 55)

P-9—Core Drawing Machine

Availability of a new Model CD-36 core drawing machine capable of performing one complete core-draw cycle in as little as 18 seconds, is announced by Spo, Inc., Cleveland, Ohio. Suitable for operation with any type core blower, the unit can be used singly, in pairs for double shuttle operations, and in circular conveyor systems handling high production.

The machine requires only one man for operation. The core box is positioned rapidly by means of parallel sets of dust-tight ball bearing rollers and guide rails. After the core plate is clamped into place, the core box is lifted pneumatically for manual roll over. Core plate supports on the machine bed are then positioned and the core box is lowered. Removal of plate



Spo Model CD-36 core drawing machine. (1) worker positioning core box, (2) core box in raised position, rolled over, and core plate supports being positioned, (3) core box lowered, clamps removed, and (4) core box drawn and core being removed from the machine.

clamps permits the box to be drawn automatically for core removal and subsequent handling.

Air powered by standard 80 psi line pressure, Model CD-36 core draw machine provides an enclosed lifting mechanism (front and rear), and a one-piece lifting yoke which eliminates the need for links and squaring shafts. An adjustable secondary stop is automatically placed into operation by the four-way operating control valve to limit lowering of the core box (prior to actual draw), thereby preventing possible damage to the core.

The new machine handles core boxes from 24 to 36 in. in length, with guide rail width supplied to suit. A hinged yoke-type trunnion can be furnished for handling deep core boxes.

P-10—Pneumatic Relay

Moore Products Co., Phila., Pa., announces a pneumatic relay for use with air-electric switches and other equipment requiring accurate, high-speed operation. Providing sharp cut-off action, a cut-off point can be set for any pressure between zero and 35 psi. Overloading with input pressures up to 70

Here is the answer to your Spring Problems!
A Handbook on Springs free for the asking
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AMERICAN-FORT PITT SPRING DIVISION
Better Built EQUIPMENT
SPRINGS
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If you are designing or making a product requiring a spring in its assembly, you will want this book—a 28-page handbook of engineering data on springs—28 pages of formulas, graphs, charts, tables and drawings. This book will tell you all you need to know about specifying springs of any type from light wire to heavy elliptic leaf springs. It's yours for the asking—write for your copy today.
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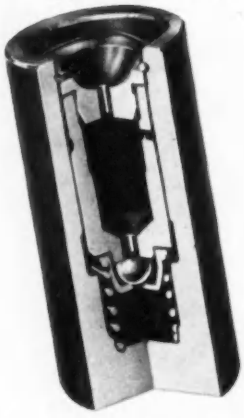
HYDRAULIC VALVE LIFTERS

Use Hydraulic Valve Lifters in your engine to put a stop to tappet noise and gain these five additional advantages . . .



1. Elimination of valve clearance adjustments.
2. Longer valve life.
3. Smoother engine performance.
4. Absorption of cam tolerances and runouts.
5. Automatic compensation for expansion and contraction of engine parts.

Let us tailor a Hydraulic Valve Lifter to your present or future automobile or truck engine design. Our current production rate is more than sixty-five thousand units a day.

Read the complete story of our Hydraulic Valve Lifters in this bulletin designed especially to inform automotive executives.

DIESEL EQUIPMENT DIVISION
General Motors Corporation
GRAND RAPIDS, MICHIGAN

NEW PRODUCTS

For additional information please use coupon on page 60

psi will not damage the instrument, and supply pressures as high as 50 psi may be used. Design provides a high amplifying ratio, so that a very small change in input pressure results in a full change in output. Tests on repeating accuracy have shown that this relay operates, after 8½ million cycles, with a deviation of only 0.000002 to 0.000004 in. Standard instruments are furnished for direct action; that is, an increase of input air pressure causes an increase of output pressure.

Special Tooling Triples Ultramatic Pump Production Rate

By using only one tool head for mounting all tools to perform nine roughing operations simultaneously on its cast aluminum converter pump for the Ultramatic drive, Packard Motor Car Co. has tripled output per machine on these operations. Formerly the part was machined with individually-fed tools on a hand screw machine. With the new tooling employing modified standard Carboloy tools in a Gisholt No. 12 high production lathe, about one lb of metal is removed in 30 seconds. Cutting speeds on the aluminum casting range as high as 3400 sfpm, spindle speed being 800 rpm. The OD of the pump is 13½ in.

The operation consists of nine cuts—three facing, one boring, three combined boring and facing cuts, and two combination facing and chamfering cuts. Total feed is 0.012 in. per revolution.

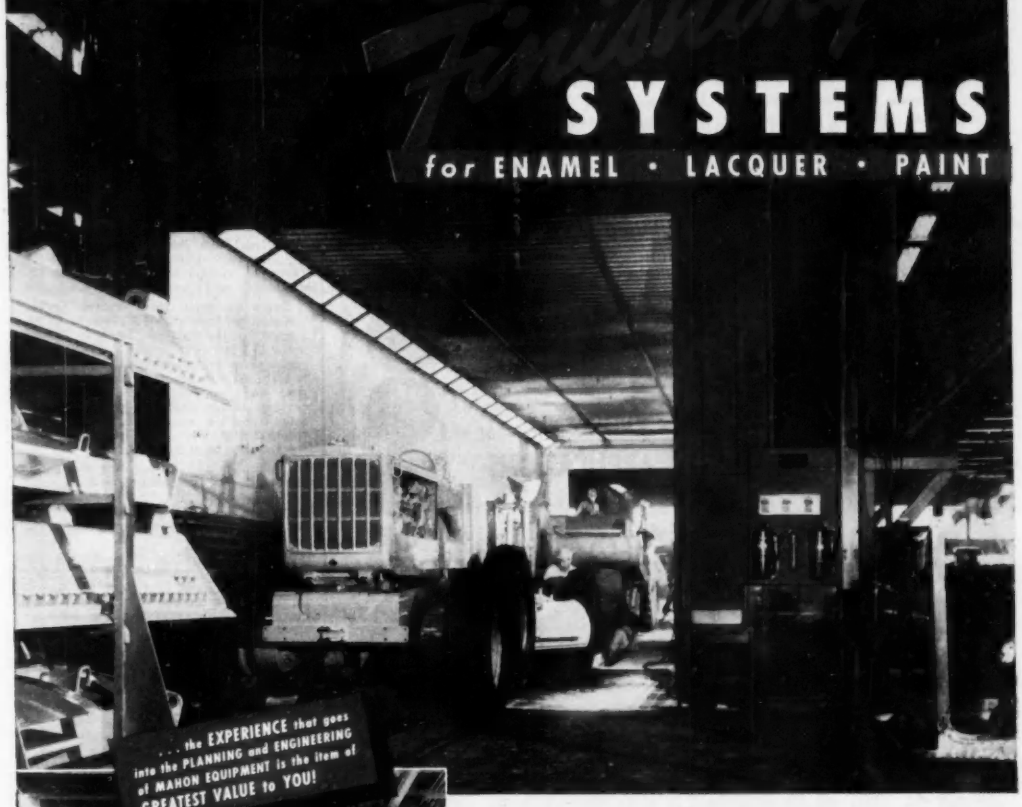
Seven of the nine tools used are Carboloy standard styles, Grade 883, slightly modified so as to have a 10 deg front rake and a 12 deg side rake. One complete set of sharpened tools is kept in the tool room and one sharpened set is in readiness at the machine, while the third set is in use. Three of the tools are changed after machining around 200 pieces, the change requiring less than 20 minutes. The other six require sharpening after 2000 pieces.

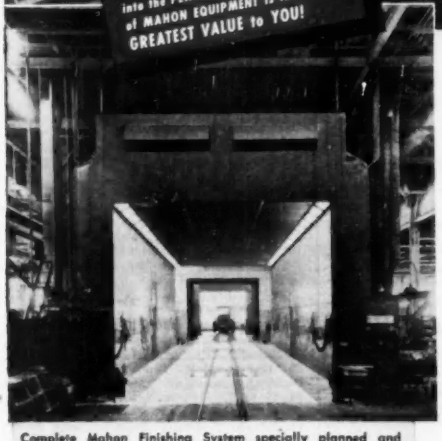
Other equipment on the machine assisting in achieving the high output—current rate averages 45 pieces per hr and can easily be increased to 60 per hr—includes a vacuum operated work holding chuck.

No trouble is experienced, apparently, from "built-up" edge on the tools. Contributing factors may be the high cutting speed and the use of a vaporized film of cutting oil directed by air pressure onto the carbide tips through a series of small pipes.

COMPLETE *Finishing* SYSTEMS

for ENAMEL • LACQUER • PAINT





Complete Mahon Finishing System specially planned and engineered to meet the production requirements of Caterpillar Tractor Co., Peoria, Ill., manufacturers of Diesel Engines, Tractors, Motor Graders, and Earthmoving Equipment.

"Caterpillar" Diesel Tractors, Earthmoving and Road Building Equipment Painted in a Mahon System!

After purchasing several units of Mahon Finishing Equipment, which included Cleaning and Pickling Equipment, Spray Booths, and Drying and Baking Ovens, it was only natural that "Caterpillar" should turn to Mahon for a complete finishing system to handle painting of their Tractors, Motor Graders, and other units of heavy road building equipment on a straight line production basis. Mahon's solution to "Caterpillar's" requirements is illustrated above . . . it is a Complete Finishing System embodying a Cleaning Booth and a large Down-Draft, Tunnel-Type Spray Booth with an Integral Air Supply System which is controllable for volume and temperature. You, too, can reduce finishing costs with modern Mahon equipment planned and engineered to meet your specific requirements. If you are contemplating new finishing equipment, remember that the Mahon organization has pioneered development in this highly specialized field for over thirty years — and that Mahon engineers have, through constant research and experimentation, accumulated a wealth of technical knowledge and practical know-how not available to you elsewhere. See Mahon's Insert in Sweet's Mechanical Industries File, or write for Catalog A-650.

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Engineers and Manufacturers of Complete Finishing Systems—including Pickling Equipment, Metal Cleaning and Rust Proofing Equipment, Dry-Off Ovens, Hydro-Filter Spray Booths, Filtered Air Supply Systems, and Drying and Baking Ovens. Also Core Ovens, Hydro-Foam Dust Collectors, and many other Units of Special Production Equipment.

MAHON

Making Low and Reverse Bands for the Powerglide

(*Continued from page 37*)

assembly is then placed on a bonding fixture where it is heated and held for eight minutes to fully polymerize the cement. At the end of this time, the assembly is removed from the fixture.

The flexible steel liner is now removed and the excess width of friction material is ground off. The ID of the bonded assembly is bored to the correct diameter and a series of annular grooves to facilitate the control of oil are cut into the friction material. A spring and rivet assembly is placed in the holes in the lugs, and the final slotting is performed to allow for compression of the band. The assembly then passes through a furnace and the lining is given its final cure. All completed bands are given 100 per cent inspection and oil dipped before shipment.

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AND OTHER BALL APPLICATIONS

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Precision balls made for your job — available in a variety of materials. Your specifications will receive prompt attention in our Engineering Department. We are thoroughly experienced in supplying the automotive industry with special bearings, retainers and balls. Let us give you our recommendations.

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Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for AUTOMOTIVE INDUSTRIES.

Although general business activity declined slightly during the week ended June 3, it continued to compare favorably with activity a year ago. Department store sales, bituminous coal production, and railway freight loadings were lower than in the previous week, while electric power production, crude oil output, and construction increased. The *New York Times* index of activity for the week ended June 3 stands at 159.2, as compared with 160.1 in the preceding week and 140.8 a year ago.

Sales of department stores during the holiday week ended June 3, as reported by the Federal Reserve Board, were 260 per cent of the 1935-39 average, as compared with 282 in the week before. At this level, the value of sales was one per cent more than in the corresponding week of last year. The total reported since the beginning of the year is two per cent below the comparable sum in 1949.

Production of bituminous coal and lignite during the same week is estimated at 9,291,000 net tons, 794,000 less than the output in the week before and 798,000 below the corresponding amount in 1949.

Railway freight loadings during the week ended June 3 totaled 709,587 cars, 9.1 per cent less than the figure for the week before and 1.5 per cent more than the corresponding number recorded a year ago.

Electric power production rose moderately during the week ended June 10. Total output was 11.7 per cent above the comparable amount in 1949, as compared with an advance of 12.2 per cent shown in the preceding week.

Crude oil output in the week ended June 11 averaged 5,227,650 barrels daily, 100,950 more than in the preceding week and 296,900 above the corresponding production of last year.

Civil engineering construction volume reported for the five-day week ended June 8, according to *Engineering News-Record*, was $226,729,000, or 10 per cent above the figure for the preceding four-day week and slightly more than the comparable sum in 1949. The total recorded since the beginning of this year was 43 per cent more than that for the same period in 1949.

The wholesale price index of the Bureau of Labor Statistics during the week ended June 6, at 157.4 per cent of the 1926 average, was 0.4 per cent more than in the preceding week and 0.8 per cent above the corresponding figure in 1949.

Member-bank reserve balances rose $253 million during the week ended June 7. Underlying changes thus reflected include increases of $208 million in Reserve bank credit and $82 million in non-member deposits and other Federal Reserve accounts and decreases of $9 million in money in circulation, $1 million in Treasury cash, and $116 million in Treasury deposits with Reserve banks.

Total loans and investments of reporting member banks declined $143 million during the week ended June 7. An increase of $35 million in commercial, industrial, and agricultural loans was more than offset by a reduction in holdings of Government securities. Total business loans, at $13,394 million, were $30 million below the comparable sum a year ago.

Since 1846

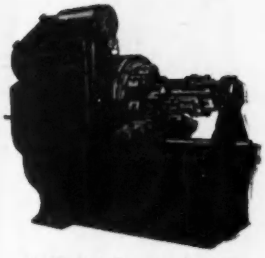
BAIRD HIGH PRODUCTION MACHINES

For producing articles made of wire, ribbon metal, castings, forgings or cut off bar stock

● BAIRD 12-Station Duplex Turning Machine is for such as turning the four trunnions on the "spider" or journals for universal joints and forming and facing the yokes of such joints.

BAIRD 12 Station Duplex Turning

● BAIRD 76H Chucker is an Automatic 7" Six Spindle, Indexing, Horizontal Lathe with different speeds available at the work spindles for different operations in the one handling of a piece and with other time saving features.

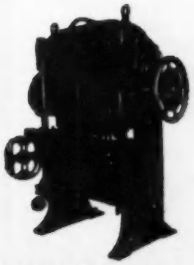


BAIRD 76H Chucking Machine

● BAIRD 54VC Lathe is an Automatic 5" Four Spindle, Vertical Continuous Machine for many light or finishing cuts on parts, as facing ends or chamfering grooves on pistons, etc.

BAIRD 54VC Lathe

● BAIRD Multiple Transfer Presses for Multiple operation in one handling on articles made from ribbon metal.



BAIRD Multiple Transfer Press

BAIRD ALSO MAKES

BAIRD Four Slide Wire and Ribbon Metal Forming Machines in many sizes to cover the thousands of articles made from wire and ribbon metal.

BAIRD Tumbling Equipment for deburring, smoothing, cleaning, polishing, ball burnishing, heated drying, etc.

Send samples of each article you want to make in quantity.

State the quantities to be made of each piece you want to make in a given time.

Give electrical current specifications.

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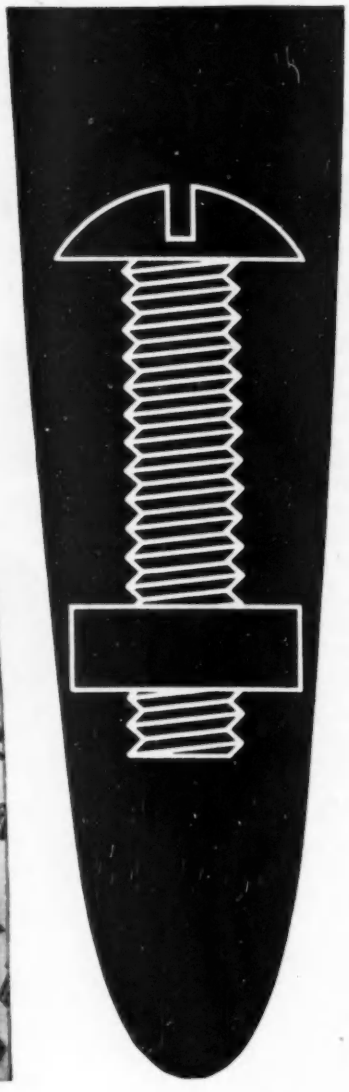
1700 STRATFORD AVE. STRATFORD, CONN.

stove bolts take a turn for the better

WHEN THEY'RE BLAKE-AND-JOHNSON PERFECT!



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BLAKE & JOHNSON *Fastenings*

THE BLAKE & JOHNSON COMPANY, WATERVILLE 48, CONNECTICUT

Publications Available

(*Continued from page 60*)

wires, and covers the development, properties, applications, advantages and available sizes of these wires. Test data, graphs, illustrations and pertinent specification tables are included in the book. A special section is devoted to installation details such as methods of stripping, soldering and welding, as well as a complete discussion on varnish treatment.

L-9 Metal Working Facilities

Charles T. Brandt, Inc.—The company's stamping and metal working facilities, called a List of Equipment, in the form of a cardboard folder to be used as a reference file, is available. A complete list of plant equipment—presses, punches, shears, spot welders, shapers, etc., are given, together with production facilities—stamping, welding and shipping facilities.

L-10 Diesel Oil

D-A Lubricant Co., Inc.—A new folder on D-A Diesel Oil describes how and why the oil reduces engine deposits and neutralizes destructive combustion chamber acids. A table showing Diesel Oil recommendations for automotive vehicle is given.

L-11 Sintering Furnaces

Lindberg Engineering Co.—A new 8-page bulletin, No. 230, illustrates and describes the complete line of Lindberg Sintering Furnaces. Hand pusher type furnaces, mesh belt furnaces, mechanical pusher and roller hearth furnaces are included in the descriptions.

L-12 Magnetic Separators

Dings Magnetic Separator Co.—Described and illustrated in a new 8-page catalog, is the application, operation and design of the company's non-electric, Alnico Perma-Drum Magnetic separator. Typical installation diagrams are shown with recommendations.

L-13 Hard-Facing Alloys

Haynes Stellite Div., Union Carbide and Carbon Corp.—A new 40-page hard-facing manual is available. The booklet, entitled "Haynes Alloys—Hard-Facing Manual," tells the complete story of hard-facing. Information is given on the properties and available sizes of twelve Haynes hard-facing materials.

L-14 Contour Grinding

The Cleveland Grinding Machine Co.—The new color folder on Visual Grind describes the tree grinding techniques—all in one machine—and provides illustrations and diagrams showing construction and features. Specifications include screen dimensions, lens information, capacity, feed range, work table dimensions lubrication, etc.

LEAD ACCURACY

WITHIN .0001" PER INCH
IS NOT UNCOMMON...

IN
Hanson-Whitney
"FINISHED"
TAPS

The accompanying illustration shows perfect contact between the nut (internal) and the screw (external) threads... when lead, angle and diameters of both are correct.

Especially important in achieving this result is Lead Accuracy in the nut ... obtainable only when "Finished" taps have been used in tapping the nut.

Hanson-Whitney "Finished Taps" are finished after hardening... with thread lead accuracy within .0001" per inch, together with correct form and diameters, will give you tapped holes of greatest accuracy... so necessary for today's production and assembly operations.

Hanson-Whitney equipment for producing "Finished Taps" adequately covers the entire tap field. Diameters from 1/16" to 7½", and leads from 100 threads per inch to one thread in 7" can be produced. No better taps are made.

HANSON-WHITNEY COMPANY, HARTFORD 2, CONN., Division of the Whitney Chain Company

Valuable engineering, illustrated Catalog on request. Please use your business stationery.

Hanson Whitney
PIONEERS OF FINISHED TAPS

BNWSO

MEN *in the* NEWS

(*Continued from page* 25)

The B. F. Goodrich Co.—**William E. Ireland,** Vice-President of Sales of International B. F. Goodrich Co., has been named Vice-President-General Manager of the Tire Sales Division.

Hood Rubber Co.—**Harold B. Leland,** Manager of Industrial Relations, has been appointed Vice-President in charge of Manufacturing.

Rochester Products Div., General Motors Corp.—The appointment of **Ralph B. Knight** as assistant general manager, has been announced.

South Gate Brake Specialties Co.—**Wesley White** has been appointed Sales Manager.

Kennedy Valve Mfg. Co.—**J. Lawrence Kennedy** has been elected Vice-President and Secretary of the company and has been named to the Board of Directors.

The Budd Company—**John Hihn, Jr.,** has been appointed Comptroller of the company.

Wall Colmonoy Corp.—**R. L. Peaslee** has joined the company in the capacity of Development Engineer.

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Requires EXPERIENCE!

NOTHING we make tells a more complete story of quality than the king pin shown here—involving expert knowledge of materials; close-limit, intricate machining; scientifically controlled heat treatment; and micro-finish grinding. Result: A product in which both automotive manufacturers and ultimate users can have the utmost confidence.

Our specialization of over 40 years has earned us many satisfied customers among makers of trucks, tractors, trailers, buses, axles, off-the-road machines, and Diesel locomotives. We would like to have you consider Brown Hardened and Ground Parts for your own requirements. Please write or wire.

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Brake Anchor Bolts
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Idler Shafts
Stub Axle Shafts
Steering Ball Bolts
Beam Bolts and Bolts
5th-Wheel Rocker Shafts
Wheel Studs
Water Pump Shafts
. . . anything in the hardened and ground line, of any analysis steel, up to 4¼" diameter.

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Dynaflow Brake Band Simplified and Improved

(*Continued from page* 44)

washing machine, again degreased in a Detrex degreaser and shot-peened on the inside diameter in a No. 1 American Wheelabrator having a 12-station table. For shot-peening Buick uses 0.035 in. clipped wire shot. The object of shot peening in this instance is to impart sufficient compressive stress to obtain a free opening between 0.50 and 0.75 in. when the band is sawed apart at the lug.

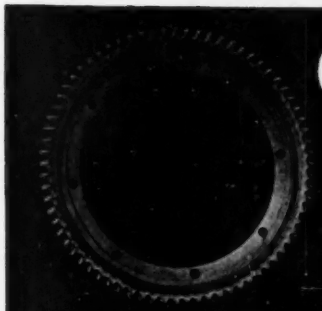
Meanwhile the linings are stored in a self-contained department and are given a spray coat of bonding cement of specified types, including Cycleweld and Goodrich Plastilock. This material is applied with a spray gun in a Newcomb-Detroit booth.

The band now meets the liner. Liners are put through a small rolling machine to roll them into shape, then they are inserted in the band, ready for installation in the bond curing fixture. Curing requires a cycle from four to five minutes at a temperature of 400 F. In this cycle, the fixture is so arranged that it will automatically unclamp the band after one minute of cure and permit it to dwell for a short interval so as to release the vaporized solvents. Then the band is re-clamped and held securely to the end of the cycle.

After curing, the band is ground on both sides on a Hammond abrasive belt grinder to remove excess liner width. This is followed by finish-boring and grooving of the liner in an Ex-Cell-O single-end, precision boring machine. Final step is to mill a ¼-in. slot through the center at the lug, this being done in a No. 2-24 Cincinnati rise-and-fall milling machine. A milling cutter with inserted cemented-carbide blades is used for this operation.

Read
AUTOMOTIVE INDUSTRIES
Regularly and Thoroughly

Hardening



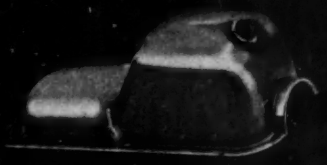
Production up from 14 to 35 per hour, and savings of $82,507 per year on this International Harvester gear.

Over 4¢ saved on every part, 600 parts per hour when Lima-Hamilton TOCCO-hardens these shifting levers.

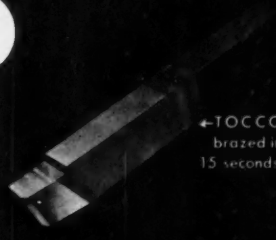
Hardening costs cut 80% by TOCCO-hardening wearing area of Link Belt Company conveyor trolley wheels.

Brazing

Kennametal, Inc. brazes carbide tips on these mining machine bits and hardens shanks at the same time. Output—one every 20 seconds.



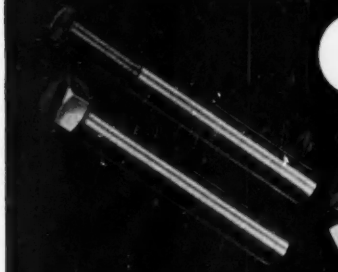
Nash Motors cuts cost 60%, triples hourly output by TOCCO-brazing drain flanges to automotive oil pans.



←TOCCO brazed in 15 seconds.

A 6¢ TOCCO-brazing job saves $17,000 tools—saves $2,000 a month at a midwest automotive parts plant.

Forging



H. M. Harper boosts production up to 265% and die life up to 400% by TOCCO-heating non-ferrous bolt blanks for forging.

Scale was reduced from 2.79% to .79% by applying TOCCO to heating bar stock for forging rock drill bits at Timken Roller Bearing Company.

Tractor track link forging.

Forging die life tripled and scale reduced over 99% when Willy's Overland Commercial Forge Plant installed TOCCO Induction Heating for forging.

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GM-UAW Contract

(*Continued from page* 31)

smaller companies band together and pay pension contributions into a common fund, equalizing the cost. An advantage to employes is that they may shift from one plant to another within the group without losing retirement benefits. Such a plan recently was put into effect in the Detroit area providing pensions of $100 a month for about 4000 workers in 62 tool and die shops.

So far very little has been said about the effect of pension plans on automobile prices. Previously, wage increases have been reflected in increased prices for the product. Since pension plans have come into vogue prices have not increased, leading to the fallacious belief that somehow pensions do not represent an added labor cost the same way that a direct wage increase does. Nothing is further from the truth, of course, and the added cost will have to come from somewhere and there are only two sources—the company's own profit or the customer. Obviously, some of the larger companies may be able to absorb all or part of the added labor cost, but it is not conceivable that they are going to greatly reduce their percentage of profit and even though prices don't go up, reductions are less likely or in some cases would not be nearly so great as would be the case otherwise. There are, of course, many smaller companies whose entire profit would be much less than the cost of a pension program and for them the outlook is a bleak one since about the only way to recover the expenditure would be in the form of a price increase, a dangerous remedy in a competitive market, especially if their larger competitors do not do so.

According to union estimates, the General Motors package deal amounted to 19 cents an hour, a figure which qualified observers say is high. It generally is believed that cost to GM is somewhere from 15 to 16 cents an hour, which still is considerably above the 10 cents won from Chrysler, Ford and Nash.

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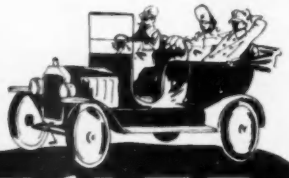

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Free Piston Engine

(*Continued from page* 50)

In the final part of the study the design method was applied to a Pescara gas-generator. Test performance data of the Pescara system, recently published by Professor G. Eichelberg of Zurich, showed that the unit has a 1138 turbine shp capacity and operated at full-load with a specific fuel consumption of 0.40 lb per turbine shp hr.

Pescara system design and performance details are summarized in Table 3. Numerical values contained in this table, with the exception of those indicated by asterisks, were quoted by Eichelberg. Magnitudes denoted by asterisks were either assumed or obtained as the result of the thermodynamic-dynamic analysis.

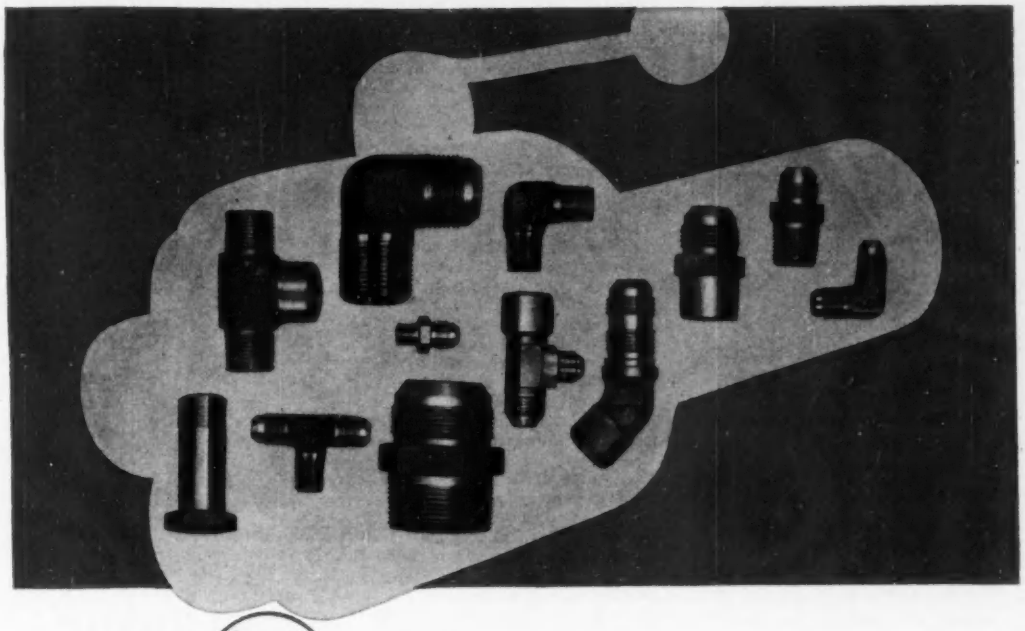
Main conclusions reached from this phase of the study are:

(1) The method proposed in the Stanford report can be used successfully for thermodynamic - dynamic analysis of free-piston machinery provided that certain idealizations are made with adequate accuracy.

(2) Idealizations requiring the greatest care in their specifications are not such factors as valve pressure drop and the magnitude and character of the friction forces, but rather maximum temperature of the engine cycle which is related to air-fuel ratio, per cent heat transfer to the coolant, engine compression ratio, and compressor pressure ratio, plus the polytropic exponent for the engine power stroke.

(3) An appraisal of the performance of the Pescara unit demonstrated that

(*Turn to page* 78, *please*)



VERS-O-TOOL—THE STANDARD

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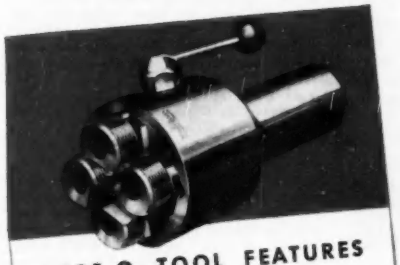

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considering the engine compression ratio, which is rather low, approximately 8.5 to one, the Diesel engine indicated performance is quite satisfactory. Evidently the fuel injection and combustion problem was adequately solved in Pescara design.

(4) Efficiency of the Pescara unit could be improved and the output increased by operating at a higher discharge pressure for the generated gas. Higher delivery pressure would mean an increased compressor pressure ratio, a higher engine peak cycle temperature, and an increase in temperature of the gas delivered to the turbine. Coupled with the higher delivery pressure, the higher temperature would increase the turbine output and the plant thermal efficiency. The limiting factor of such changes is the ability of the system to withstand higher temperatures and pressures in the Diesel cylinder. It is these temperature and pressure conditions which cause the difficulties of piston-cylinder lubrication and cooling characteristics of all highly supercharged engines. Possibly a large measure of the success of the current Pescara development is due to the selection of the relatively moderate pressure and temperature levels of the cycle even at the expense of plant thermal efficiency. As this unit is the last of 17 operating designs constructed by the Pescara organization, this conservatism may well be born of experience.

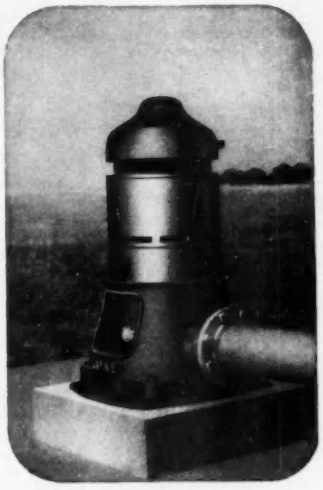
(5) It is to be noted that the Pescara unit operated with an imep of about 230 psi, and continuous power runs of 300 hr. This success convincingly demonstrates that, granted sufficient developmental effort, the free-piston gas generator turbine plant will prove to be a practical prime mover.

BOOKS ...

(*Continued from page 35*)

RESIDUAL STRESSES IN METALS, by *Dr. William Marsh Baldwin, Jr.*, published by *American Society for Testing Materials*, 1916 Race Street, Philadelphia 3, Pa. Price $1.00. This Edgar Marburg Lecture prepared in booklet form covers the fundamental differences in the mechanisms by which residual stresses are developed by cold-working operations such as rolling, drawing, and extrusion by heat treatment, casting and welding.

ELEMENTS OF PRACTICAL AERODYNAMICS, Fourth Edition, by *Bradley Jones*, pub., *John Wiley & Sons*, 444 pp. Intended as an elementary text on the subject of aerodynamics, the fourth edition has been largely rewritten and rearranged to aid in classroom presentation. In its present form the book may serve either as a general survey or a preliminary to more theoretical treatment. Only elementary calculus is required for a full understanding of the text. One of its major features is found in the addition of many illustrative problems with step-by-step solutions, as well as a revision of all problems.



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How Many Car Owners Ever *See* A Universal Joint?

Millions of American motorists like to tinker with their cars. Some confine their efforts to adjusting carburetors, others do major repair work. All of them—as well as millions more who let service shops look after their cars—have a pretty fair knowledge of various automotive parts.

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Detroit UNIVERSAL JOINTS

DETROIT UNIVERSAL JOINTS Ball and Needle Bearing

UNIVERSAL PRODUCTS COMPANY, Inc., Dearborn, Michigan

Highlights of the SAE French Lick Meeting

(*Continued from page* 41)

ever, become exceedingly complex experimentally because of the existence of the flame front in the cylinder and because of the difficulty of isolating the end gas or last portion of the charge to burn. In the motored engine no flame front exists, since no spark is passed, and the entire charge in the cylinder can be subjected to the physical conditions met by the end gas in a fired engine. Thus, with the elimination of these two experimental difficulties, the motored engine makes an ideal reactor for end gas reaction studies.

The work reported is the first phase of a general project on end gas reaction studies having as its broad objective the development of new information on the chemical factors causing knock. To determine the suitability of the motored engine technique for studying precombustion reactions, fuel-air mixtures have been subjected to essentially the same pressure-temperature-time conditions to which the end gas is subjected in a fired engine, and the effects of pertinent variables on the extent of reaction have been determined by:

1. Measurement of the change in cycle pressures resulting from the reactions, and

2. Measurement of the physical conditions necessary for cool flames and autoignition.

The following major conclusions can be drawn from these investigations:

1. Precombustion reactions in a motored engine are affected by physical and chemical variables in the same manner in which these variables affect knock in a fired engine.

2. Both tetraethyl lead and aniline start to suppress precombustion reactions in the same temperature regions. Also, at least a portion of the antagonistic effect of sulfur compounds toward tetraethyl lead occurs in a motored engine at temperatures considerably lower than the peak temperatures of the unburned end gas in a spark-ignition engine.

3. Generally, cool flames are observed in a motored engine at about the same point in the cycle at which the pressure-time curve for the reacting fuel exhibits a pressure increase above the pressure-time curve for the non-reacting fuel.

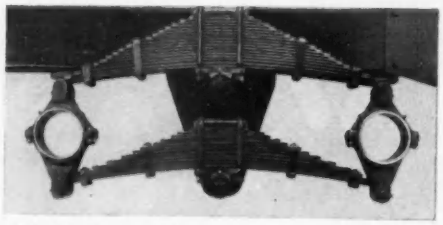
4. Increasing the octane number of a fuel, whether by changing the hydrocarbon type or by adding tetraethyl lead, broadens the range of physical conditions required for the occurrence of cool flames and displaces the autoignition limit curves in the direction of higher pressures.

5. Autoignition in a motored engine and trace knock in a fired engine, operated under the same mechanical conditions, occur at essentially the same temperatures and pressures, providing confirmation of the similarity between motored engine precombustion reactions and fired engine end gas reactions. This is considered to be evidence in support of the autoignition theory of knock.

6. Two different techniques have been developed for studying simulated end gas reactions in a motored engine.

The information presented has shown the motored engine to be an extremely valuable and versatile combustion research tool because it permits the study of simulated end gas reactions without the complications of the flame in the cylinder.

(*Turn to page* 82, *please*)



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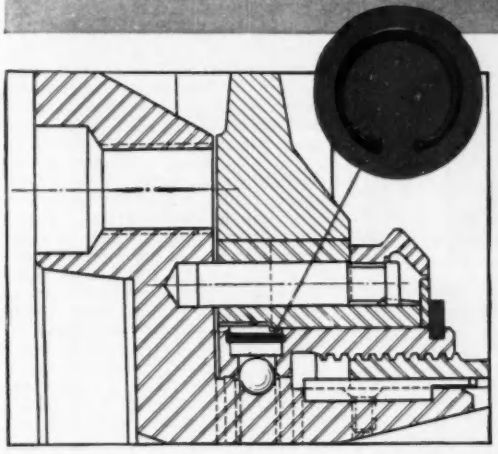
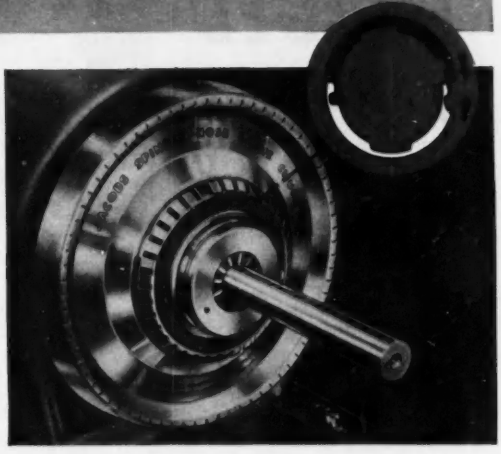


INTERNAL RING: Used instead of a shoulder screw, Truarc internal ring #5000-37 locks disc over ball loading hole. Saves 1/8 inch in overall diameter. Eliminates tapping. Withstands machine vibration and vibration from impact device within chuck. Used with Truarc pliers, it facilitates assembly and disassembly.



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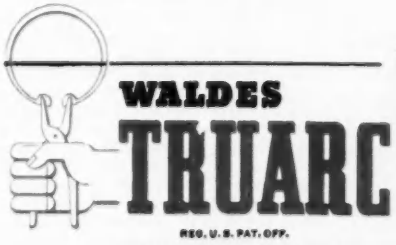

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(*Continued from page* 80)

Effects of Sulfur in Gasoline on Engine Operation

By R. E. Jeffrey, Shell Oil Co., J. B. Duckworth, Std. Oil Co. (Ind.), and E. J. Gay, Consultant

THE increasing utilization of high sulfur crudes to supplement crude supply during and following World War II has focused attention on the possible effect of sulfur in motor fuel on engine wear, corrosion, deposits and other factors affecting engine life. Extensive work on these problems had not been conducted since the early 1920's, largely because since that time, improvements in engine design, particularly the almost universal use of crankcase ventilation and thermostatic control of engine jacket temperature, have reduced the incidence of trouble from sulfur in motor gasoline to a point where it is not currently recognized as an acute problem. This is further borne out by the satisfactory operation experience on the West Coast of the United States, where moderately high sulfur levels in gasoline have been used for many years.

Also, certain surveys made prior to the war, did not tie increased sales of pertinent engine and exhaust system parts to the areas where higher sulfur fuels were sold. However, it was recognized that adequate up-to-date technical information was not presently available, and at a meeting of the Executive Committee of the Coordinating Research Council Board of Director, the petroleum members proposed that factual data on this subject would be desirable. The problem was assigned to the Motor Fuels Division of the Coordinating Fuel Research Committee in Sept. 17, 1945.

Twenty vehicles in three fleets representing four types of engines used in a heavy duty or moderate duty continuous service such as over-the-road trucks, urban bus service or medium bus service showed essentially no difference in wear for gasoline sulfur contents (.091 to .281 per cent). Thirty-four vehicles in four fleets representing five types of engines, in light duty intermittent service with many stops and starts or idle periods per day produced consistent differences in wear within the sulfur limits of .063 to .290 per cent. Eight vehicles in one fleet engaged in typical medium duty intermittent delivery service, door-to-door, showed a marked increase in wear. In this fleet wherein the low sulfur fuel was 0.056 per cent and the high sulfur fuel 0.269 per cent, and wherein a regular grade of oil was used, wear for the high sulfur engines had progressed to the level of requiring an overhaul. The use of a heavy duty crankcase oil in one fleet produced a 50 per cent reduction in cylinder wear in vehicles operated on the low sulfur fuel, but did not appreciably reduce cylinder wear in the high sulfur vehicles.

(*Turn to page* 84, *please*)

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The test data reported, show that the influence of up to 0.3 per cent sulfur in gasoline, as compared to gasolines of 0.1 per cent sulfur and lower, may vary from a pronounced effect on cylinder and ring wear under some operating conditions to no effect under continuous operation at normal engine temperature. This increased wear, to a considerable extent, does not check general field service experience, even in the areas where high sulfur gasolines have been widely used.

Valve Problems in Diesel Engines

By Vincent Ayres, Asst. Chief Engineer, Valve Div., Eaton Mfg. Co.

In summary, the causes of valve breakage are: (1) High loading of valve resulting from—(a) wear in valve train, (b) overspeeding, (c) high lash, (d) cam design not matched to valve gear, (e) maintenance, cocked springs, out-of-round seats, etc.; (2) Valve weakness caused by (a) design of valve structure and (b) material inadequate at temperature.

The causes of seat wear are (1) incompatible materials, (2) high unit loading, and (3) material inadequate at temperature.

The causes of valve face guttering are: (1) leakage resulting from out-of-roundness, (2) leakage resulting from deposits breaking away and (3) materials which will not withstand environment (temperature, atmosphere, indentation).

The causes of stem and guide wear are: (1) poor geometry, (2) wrong materials, finishes, etc., and (3) poor lubrication.

Sticking is caused by stem and guide deposits resulting from: (1) too high a temperature for the oil, (2) scanty oil supply, and (3) excessive stem to guide clearance.

The remedy for these problems lies in recognizing which fundamental causes apply in a given case and making use of all available knowledge towards their elimination.

Engine Wear As Affected by Air and Oil Filters

By W. S. James, Vice Pres. of Eng., Fram Corp., and B. G. Brown, Chief Eng., Dexter Div., Fram Corp.

In the operation of a unit like the Fram dust tunnel (see AUTOMOTIVE INDUSTRIES, Nov. 15, 1949, page 33), there are always disjointed observations which are incidental to the particular work in hand but which are often of general interest. Some of these items seem worthy of mention. When operating under very severe dust conditions carburetors will plug in about two hours then, the power will fall off and the engine start to miss. The plugging seems to occur in jets facing up stream and when dust gets into the float bowl from vents or idle jet passages. Distributor points pit and ignition miss occurs. Spark plugs become coated with a heavy coat of dust and on examination it is hard to imagine their firing the charge at all. Dust gets into the voltage regulator cases and contact points fail. Generator windings and armatures become heavily coated with dust, commutation is bad, and brush life shortened. Dust gets into the car body and into the upholstery in unbelievable amounts. The size of the dust particles found in the crankcase oil is much smaller than would be expected; most of it is 5 microns or less. The dust concentration approaching the car is much heavier than the dust concentration found under the hood and entering the carburetor. It is necessary to clean the fins of the radiator at every opportunity or the spaces between them will plug solid with dust. In reviewing the wear of the several cylinders of an engine there is a definite pattern of wear. Some cylinders will be outstanding in wear while others will wear very much less. The greatest bearing wear occurred in the cap half of the main bearings and in the rod half of the connecting rod bearings.

In conclusion, it is believed that the work to date in the dust tunnel has indicated the following:

(1) It will be possible to put a quantitative evaluation of the various factors involved in causing engine wear and the means used to prevent this wear. This will assist the designing engineer to determine how much of his protection dollar he should spend on which cause of wear and the effectiveness of the devices at hand to provide the desired protection.

(2) Some oil wetted types of carburetor air cleaners are of almost no value in protecting an engine against ruin from air borne dust.

(3) An oil bath carburetor air cleaner will reduce ring and bore wear to one-tenth of that encountered with some oil wetted types.

(4) The use of an oil filter when properly serviced will reduce the wear on bearings by 50 per cent or more and definitely reduces the wear on the oil rings.

(5) The "pull-over" of oil bath carburetor air cleaners is very serious and may reduce life by several times.

(6) The increase in the efficiency of a carburetor air cleaner from 98.5 per cent to 99.5 per cent reduces wear by about one-half.

(7) The use of chrome-plated top rings will double the time the engine can be run until excessive blow-by occurs.

(8) The use of chrome-plated top rings will reduce the bore wear by about 75 per cent.

(9) The use of chrome-plated top rings will not reduce the wear of the lower plain rings.

(10) Increasing the thickness of the chrome plate on the top ring increases the ring life but not in the same proportion.

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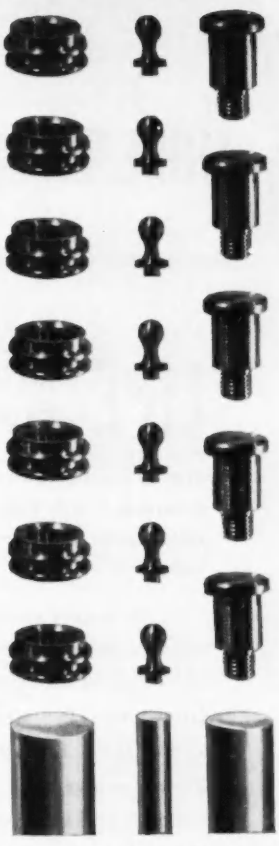

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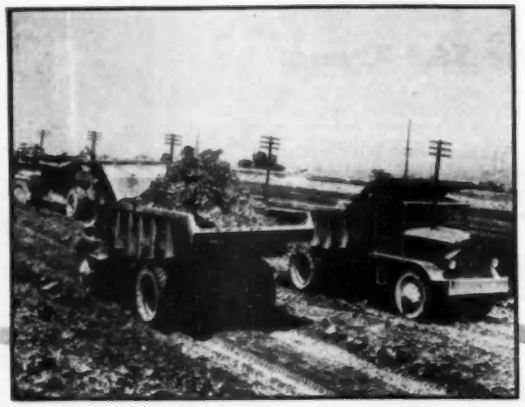

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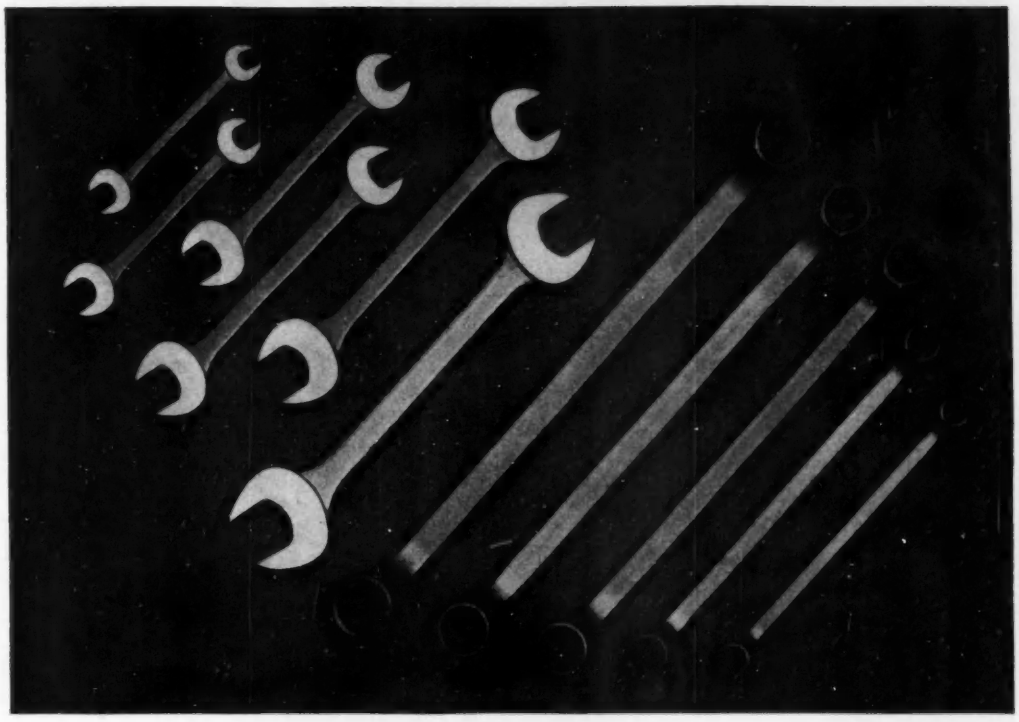

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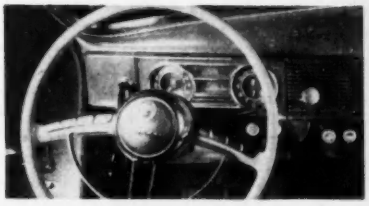

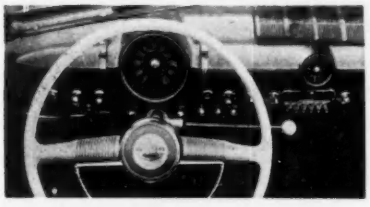

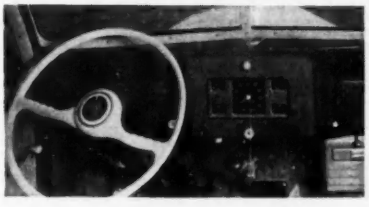

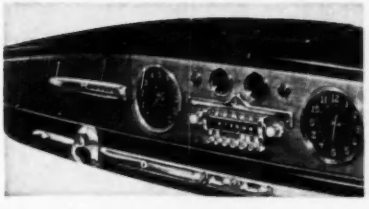

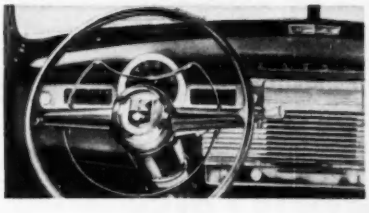

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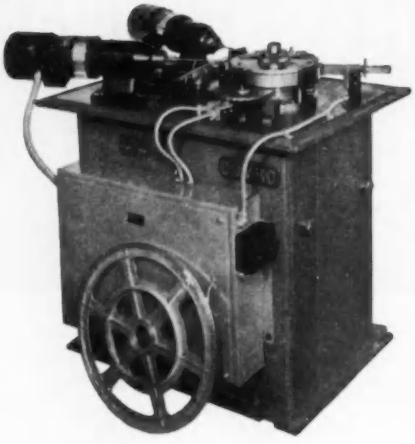

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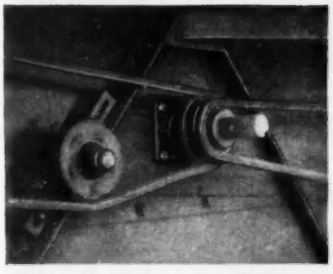

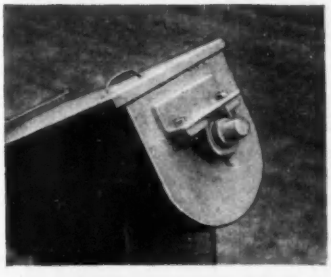

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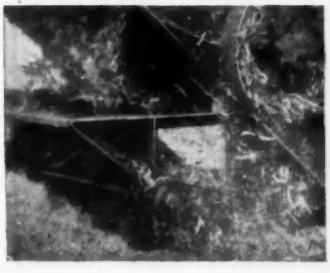

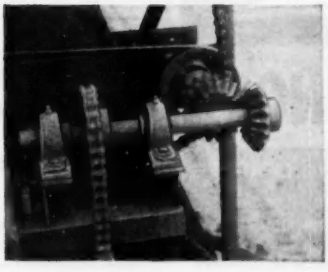

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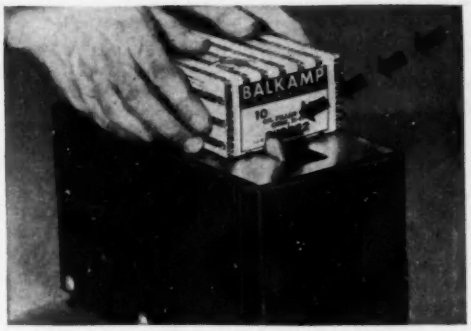

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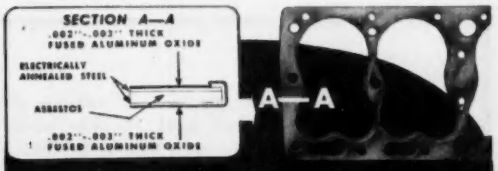

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Acadia Div. Western Felt Works 94
Accurate Spring Mfg. Co. ... —
Acushnet Process Co. 82
Aetna Ball & Roller Bearing Co. ..... —
Ajax Manufacturing Co., The —
Allied Products Corp. ..... —
Aluminum Co. of Amer. 94
Aluminum Industries, Inc. ... —
American Bosch Corp. ..... —
American Broach & Machine Co. ..... —
American Chain & Cable Co. —
American Chemical Paint Co. —
American - Fort Pitt Spring Div. 67
American Screw Co. ..... —
American Steel & Wire Co. .. —
Amgears, Inc. 82
Armstrong Cork Co. ..... —
Associated Spring Corp. ..... —
Automotive Gear Works, Inc. —
Automotive Industries 88-92

Baird Machine Co., The 71
Barber-Colman Co. ..... —
Barnes Co., Wallace ..... —
Barnes Co., W. F., & John .. —
Barnes-Gibson-Raymond ..... —
Bendix Aviation Corporation
Bendix Products Div. 14
Eclipse Machine Div. ..... —
Stromberg-Elmira Div. ... —
Zenith Carburetor Div. 66
Bendix Westinghouse Automotive Air Brake Co. 29
Besly and Co., Chas. H. 94
Bethlehem Steel Co. 89
Black & Decker Mfg. Co., The —
Blake & Johnson Co., The ... 72
Blakeslee & Co., G. S. 76
Borg & Beck Div. ..... —
Borg-Warner Corp. ..... —
Bower Roller Bearing Co. 10
Brandt, Inc., Chas. T. ..... —
Bridgeport Brass Company .. —
Brown Corp., The 74
Builders Steel Supply Co. 94
Bullard Company ..... —
Bundy Tubing Company ..... —
Burlington Mills, Inc. ..... —

Campbell, Wyant & Cannon Foundry Co. ..... —
Carboloy Company, Inc. ..... —
Carnegie-Illinois Steel Corp... —
Centrifugal Foundry Co. ..... —
Chambersburg Engineering Co. —
Chicago Rawhide Mfg. Co. ... —
Chicago Rivet & Machine Co. —
Chicago Screw Co., The 64
Cincinnati Milling Machine Co. 16
Clark Equipment Co. ..... —
Clearing Machine Corp. ..... —
Cleveland Punch & Shear Wks. Co., The ..... —
Climax Molybdenum Co. 78
Columbia Steel Co. ..... —
Columbus Coated Fabrics Corp. —
Cone Automatic Machine Co... —
Continental-Diamond Fibre Co. —
Continental Motors Corp. .... —
Continental Tool Works ..... —
Cotta Transmission Co. 1
Crane Packing Co. ..... —
Cross Company, The 7
Cummins Engine Co., Inc. .... —

Danly Machine Specialties, Inc. 9
Davis & Thompson Co. ..... —
Diesel Equipment Div. G.M... 68
Disston & Sons, Inc., Henry .. —
Dole Valve Co., The ..... —
Donaldson Co., Inc. ..... —
Dow Chemical Company, The. —
Dow Corning Corp. ..... —
Driv-Lok Pin Co. ..... —
Dunbar Brothers Co., Div. ... —
du Pont de Nemours & Co., Inc., E. I. ..... —
Dykem Co., The 94

Eaton Manufacturing Co. 8
Elastic Stop Nut Corp. ..... —
Elco Tool & Screw Corp. .... —
Electric Auto-Lite Co., The .. —
Electric Furnace Co., The .... —
Electric Storage Battery Co... 28
Ex-Cell-O Corp. 12

Fafnir Bearing Co., The..... 93
Fairfield Mfg. Co. ..... —
Federal-Mogul Corp. 83
Fellows Gear Shaper Co. ...26-27
Fitzgerald Mfg. Co., The 95
Fram Corp. ..... —
Fuller Manufacturing Co. .... —

G & O Mfg. Co., The 95
Galland-Henning Mfg. Co. ... —
Garrett Co., Inc., Geo. K. .... —
General Controls ..... —
General Electric Company ... —
Gibson Co., Wm. D. ..... —
Globe-Union, Inc. ..... —
Govro-Nelson Co. 92
Great American Industries, Inc. (Rubatex Div.) ..... —
Great Lakes Steel Corp. ..... —
Greenlee Bros. & Co. ..... —
Gunite Foundries Corp. ..... —

H & P Die Stamping Co., The 94
Handy & Harman ..... —
Hannifin Corporation ..... —
Hanson-Whitney Company ... 73
Harrison Radiator Division .. —
Hartford Steel Ball Co., The 70
Heald Machine Co., The ..... —
Heli-Coil Corp. ..... —

Index to

The Advertisers' Index is published of the advertising contract. Every rectly. No allowance will be made

Herbrand Division, The Bingham-Herbrand Corp. ..... —
Holley Carburetor Co. ..... —
Hoover Ball & Bearing Co. .. —
Hotel Pittsburgher 95
Houde Engineering Div. ..... —
Houghton & Co., E. F. 11
Hyatt Bearings Div. ..... —

Illinois Tool Works ..... —
Inland Manufacturing Div. ... —
Inland Steel Company ..... —
International Nickel Co., Inc.. 2

Johnson Bronze Co. ..... —
Johnson Products, Inc. ..... —
Jones & Laughlin Steel Corp.. 85

Kelsey-Hayes Wheel Co. 90
Kerson Co., Inc., N. A. ..... —
Kester Solder Company ..... —
King-Seeley Corp. 91

Kopp Glass, Inc. ..... —
Kropp Forge Company ..... —

Lamb Electric Company ..... —
Layne & Bowler, Inc. 78
Leeds & Northrup Co. ..... —
Lipe-Rollway Corp. 86
Littelfuse, Inc. ..... —
Long Manufacturing Div. .... —
Lord Manufacturing Co. ..... —

Magnaflux Corp. ..... —
Mahon Co., The R. C. 69
Mallory & Co., Inc., P. R. .... —
Matthews & Co., Jas. H. ..... —
Mattison Machine Works .... —
Mechanics Universal Joint Div. —
Michigan Steel Tube Products Co. ..... —
Michigan Tool Co. ..... —
Micromatic Hone Corp. 59
Midland Steel Products Co. .. —
Milsco Manufacturing Co. ... —
Minnesota Mining & Mfg. Co.. 95
Moraine Products Div. ..... —
Muskegon Piston Ring Co. ... —

N-A-X Alloy Division ..... —
Nadella 98
National Acme Co., The 77
National Broach & Machine Co. —
National Motor Bearing Co. .. —
National Steel Corporation ... —
New Britain Machine Co. .... —
New Departure Div. ..... —
Niagara Machine & Tool Works —
Norton Company ..... —

Oakite Products, Inc. ..... —
Ohio Crankshaft Co., The 75
Ohio Seamless Tube Co., The. —
Oliver Instrument Co. ..... —

Page Steel & Wire Div. Amer. Chain & Cable Co. ..... —
Palnut Company, The ..... —
Parker Rust Proof Co. 87
Pedrick Piston Rings ..... —
Perfect Circle Corp. ..... —
Pesco Products Div. Borg-Warner Corp. ..... —
Peters-Dalton, Inc. ..... —
Pierce Governor Co., Inc. .... —
Pittsburgh Steel Products Co.. —
Potter & Johnston Co. ..... —
Pratt & Whitney Div., Niles-Bement-Pond Company .... —
Purolator Products, Inc. ..... —

Quinn-Berry Corp. ..... —

Ramsey Corporation...Back Cover
Raybestos-Manhattan, Inc. (Equipment Sales Div.) ... —
Raymond Mfg. Co. ..... —
Redmond Co., Inc. ..... —
Revere Copper & Brass, Inc... —
Reynolds Wire Co. ..... —
Richards Co., J. A. ..... —
Rinshed-Mason Company 65
Rockford Clutch Div. ..... —
Ross Gear & Tool Co. ..... —
Rubatex Div., Great American Industries, Inc. ..... —
Ryerson & Son, Inc., Joseph T. —

SKF Industries, Inc. 13
Saginaw Steering Gear Div. .. —
Schmieg Industries, Inc. ..... —
Scovill Manufacturing Co. ... —
Sealed Power Corporation ... —
Seneca Falls Machine Co. ... 5
Service Spring Co. ..... —
Set Screw & Mfg. Co. ..... —
Shakeproof, Inc. ..... —
Shore Instrument & Mfg. Co. —
Shuler Axle Co. ..... —
Simonds Abrasive Co. ..... —
Spicer Mfg. Div. Dana Corp... 61
Stalwart Rubber Co. ..... —
Standard Oil Co. (Ind.) .2nd Cover
StéAme des Roulements a Aiguilles 98
Sterling Aluminum Products, Inc. 63
Strom Steel Ball Co. 62
Stuart Oil Co., Ltd., D. A. ... —
Sun Oil Company ..... —
Sundstrand Machine Tool Co.. —
Superior Steel Corp. ..... —
Synchro-Start Products, Inc... 94

Taylor Dynamometer & Machine Co. ..... —
Taylor Fibre Co. ..... —
Tennessee Coal, Iron & R. R. Co. ..... —
Texas Company, The 4
Thompson-Bremer & Co. .... —
Timken Roller Bearing Co., The ..... —
Tompkins-Johnson Company, The ..... —
Torrington Co., The ..... —
Tourek Mfg. Co., J. J. ..... —
Towmotor Corporation ..... —
Tung-Sol Lamp Works, Inc. .. —
Tuthill Pump Co. ..... —
Tuthill Spring Co. 80
Twin Disc Clutch Co. ..... —

United Specialties Company.. 6
United States Rubber Co. .... —
United States Steel Corp. .... —
Universal Products Co., Inc... 79

Vanadium Corp. of Amer. .... —
Vellumoid Co. ..... —
Vickers, Inc. 57
Victor Manufacturing & Gasket Co. ..... —

Waldes-Kohinoor, Inc. 81
Waukesha Motor Company ... —
Wean Equipment Corp. ..... —
Wellman Bronze & Aluminum Co. ..... —
Western Felt Works 94
Wheland Company, The ..... —
Wilkening Mfg. Co. ..... —
Williams & Co., J. H. 94
Wisconsin Motor Corp. ..... —
Wittek Mfg. Co. 84
Worcester Stamped Metal Co. 94
Wrought Washer Mfg. Co. ... —
Wyman-Gordon ..... —

Yates-American Machine Co.. —
Young Radiator Company ... 3

Zollner Machine Works..3rd Cover

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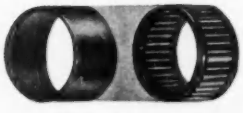

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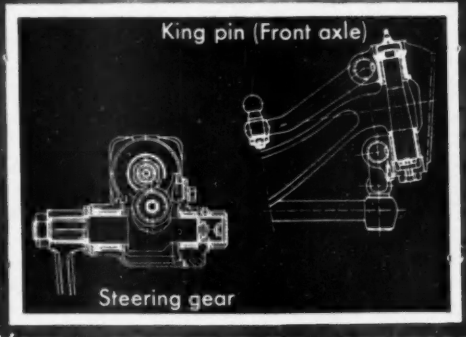

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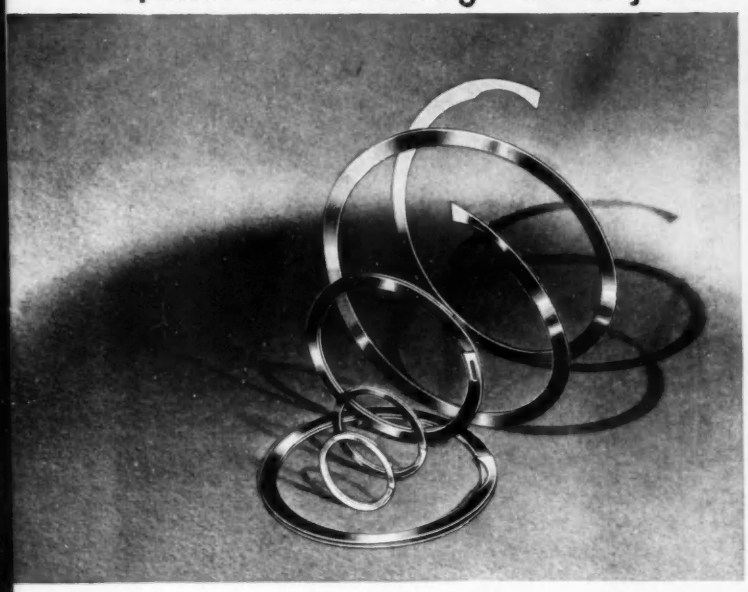

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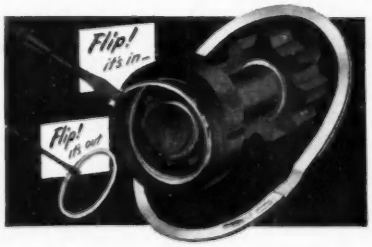

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